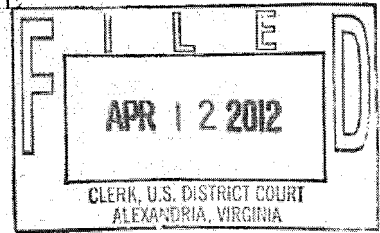


IN THE UNITED STATES DISTRICT COURT FOR THE
EASTERN DISTRICT OF VIRGINIA
ALEXANDRIA DIVISION



MEADWESTVACO
CORPORATION, *et al.*,

Plaintiffs,

v.

REXAM PLC, *et al.*,

Defendants.

CASE NO. 1:10-cv-511

MEMORANDUM OPINION

THIS MATTER is before the Court on a thirteen-day nonjury trial for Plaintiffs MeadWestvaco Corporation and MeadWestvaco Calmar's (collectively "MWV") patent infringement claims against Defendants Rexam Beauty and Closures Inc. ("Rexam America"), Rexam Dispensing Systems SAS ("Rexam France"), Valois of America, Inc. ("Valois America"), and Valois SAS ("Valois France"). This case arises from MWV's allegations that Defendants infringed its two patents, U.S. Patent Nos. 7,718,132 and 7,722,819, both entitled "Fragrance Product, Dispenser, and Dispenser Assembly." The litigation focuses on the patent claims involving the dip tube that transports the fragrance from the bottle to the sprayer. The patents disclose a dip tube that becomes invisible when immersed in the fragrance, enhancing the aesthetic appeal of the fragrance product. MWV alleges that Defendants, who design and sell fragrance pumps containing a dip tube with similar physical characteristics, infringed its patents.

Upon consideration of the record and the applicable law, the Court finds that: (1) the XRD crystallinity or crystalline content of Rexam America and Rexam France's (collectively "Rexam") V1 tube is not greater than about 13%; (2) the XRD crystallinity or crystalline content

of Rexam's V2 tube is not greater than about 13%; (3) fragrance pumps containing Rexam's V1 tube or V2 tube fall within the scope of claims 15 and 19 of the '132 patent; (4) Valois America and Valois France's (collectively "Valois") New Ultimate[®] tube ("New tube") is quenched; (5) fragrance pumps containing Valois's New tube fall within the scope of claims 15 and 19 of the '132 patent; and (6) fragrance products containing Defendants' pumps with their invisible dip tubes, *i.e.*, the V1 and V2 tubes as well as the Old Ultimate[®] tube ("Old tube") and the New tube, fall within the scope of claim 9 of the '132 patent and claims 1 and 20 of the '819 patent.

The Court concludes that: (1) Rexam America directly infringed claims 15 and 19 of the '132 patent, but Rexam France is not liable for direct infringement of the patent; (2) Valois America directly infringed claims 15 and 19 of the '132 patent, but Valois France is not liable for direct infringement of the patent; (3) neither Rexam nor Valois is liable for contributory infringement of claim 9 of the '132 patent and claims 1 and 20 of the '819 patent; and (4) neither Rexam nor Valois is liable for inducing infringement of claim 9 of the '132 patent and claims 1 and 20 of the '819 patent.

The Court finds that the infringement is not willful. The Court further finds that the case is not exceptional, and the Court will not award MWV attorney fees. Lastly, the Court concludes that a permanent injunction against Rexam America and Valois America is warranted.

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I. STANDARD OF REVIEW

In a nonjury case, the court must make specific findings of fact and separately state its conclusions of law. Fed. R. Civ. P. 52(a)(1). The trial judge finds the facts, weighs the evidence, and chooses from among conflicting inferences and conclusions, those of which he considers most reasonable. *Penn-Texas Corp. v. Morse*, 242 F.2d 243, 247 (7th Cir. 1957) (citation and internal quotation marks omitted). The trial judge may disregard the testimony of any witness when satisfied that the witness is not telling the truth, or the testimony is inherently improbable due to inaccuracy, uncertainty, interest, or bias. *Id.* (citation and internal quotation marks omitted); *see also Columbus-Am. Discovery Grp. v. Atl. Mut. Ins. Co.*, 56 F.3d 556, 567 (4th Cir. 1995) (internal quotation omitted) (stating that the fact-finder is in a better position to make judgments about the reliability of some forms of evidence, including evaluation of the credibility of witnesses). It is the duty of the trial judge sitting without a jury to appraise the testimony and demeanor of witnesses. *See Burgess v. Farrell Lines, Inc.*, 335 F.2d 885, 889–90 (4th Cir. 1964).

To satisfy the demands of Rule 52(a), a trial court must do more than announce statements of ultimate fact. *United States ex rel. Belcon, Inc. v. Sherman Const. Co.*, 800 F.2d 1321, 1324 (4th Cir. 1986) (citation omitted). The Court must “support its rulings by spelling out the subordinate facts on which it relies.” *Id.*

The language of Rule 52 has been construed

not to require a court to make findings on all facts presented or to make detailed evidentiary findings; if the findings are sufficient to support the ultimate conclusion of the court, they are sufficient. Nor is it necessary that the trial court make findings asserting the negative of each issue of fact raised. It is sufficient if the special affirmative facts found by the court, construed as a whole, negative each rejected contention. The ultimate test as to the adequacy of the findings will always be whether they are sufficiently

comprehensive and pertinent to the issues to provide a basis for decision and whether they are supported by the evidence.

Darter v. Greenville Cmty. Hotel Corp., 301 F.2d 70, 75 (4th Cir. 1962). This rule does not “require that the trial court set out findings on all the myriad factual questions that arise in a case.” *Golf City, Inc. v. Wilson Sporting Goods, Co.*, 555 F.2d 426, 433 (5th Cir. 1977). As to whether findings of fact are sufficient depends upon the particular facts of each individual case, and no general rule can govern. *Darter*, 301 F.2d at 75.

II. PROCEDURAL HISTORY

MWV commenced this action on May 18, 2011. The Second Amended Complaint contains the following counts:

Count I – Infringement of the ’132 Patent by Rexam America and Rexam France;

Count II – Infringement of the ’819 Patent by Rexam America and Rexam France;

Count III – Infringement of the ’132 Patent by Valois America and Valois France; and

Count IV – Infringement of the ’819 Patent by Valois America and Valois France.

Second Am. Compl. ¶¶ 25–66. MWV sought a “decree that Defendants have infringed, directly and/or indirectly, the ’132 Patent and the ’819 Patent” as well as “all damages available under 35 U.S.C. § 281 *et seq.*, including injunctive relief pursuant to 35 U.S.C. § 283 and damages pursuant to 35 U.S.C. §§ 284 and 285.” Second Am. Compl. ¶¶ 69, 70a.

In response, Defendants asserted counterclaims seeking declaratory judgment of both non-infringement of the patents and invalidity of the patents, as well as attorney fees under 35 U.S.C. § 285. Specifically, Rexam America asserted five counterclaims:

First Counterclaim – Declaration of Noninfringement of the '132 Patent;

Second Counterclaim – Declaration of Noninfringement of the '819 Patent;

Third Counterclaim – Declaration of Invalidity of the '132 Patent;

Fourth Counterclaim – Declaration of Invalidity of the '819 Patent; and

Fifth Counterclaim – Declaration of Unenforceability of the '132 and '819 Patents.

Def. Rexam Beauty and Closures, Inc.'s Answer and Affirmative Defenses to Pls.' Second Am.

Compl. and Def. Rexam Beauty and Closures, Inc.'s Am. Countercls. at 17–31 [hereinafter

Rexam's Answer]. Similarly, Valois America asserted three counterclaims:

First Counterclaim – Declaration of Invalidity and Non-infringement of the '132 patent;

Second Counterclaim – Declaration of Invalidity and Non-infringement of the '819 patent; and

Third Counterclaim – Declaration of Non-infringement of the '132 Patent and the '819 Patent by Dispenser Assemblies Containing the Non-quenched Tube.

Answer, Affirmative Defenses, and Countercls of Defs. Valois in Response to Pls.' Second Am.

Compl. at 16–19 [hereinafter Valois's Answer].

On October 5, 2010, the parties stipulated that MWV would not seek money damages from Defendants for infringement before May 18, 2010 for the '132 patent and before May 25, 2010 for the '819 patent. On August 17, 2011, the Court issued its Claim Construction Memorandum Opinion and Order, which construed seven terms of the patent claims, including “quenched,” “transparency,” “dispenser assembly,” “modified ethylene tetrafluoroethylene,” “about,” “XRD crystallinity,” and “crystalline content.” *MeadWestvaco Corp. v. Rexam PLC*, 807 F. Supp. 2d 537 (E.D. Va. 2011).

In its August 18, 2011 Memorandum Opinion and Order, the Court addressed MWV's Motion for Partial Summary Judgment, Rexam's Motion for Summary Judgment of Invalidity under 35 U.S.C. § 112, and Valois's Motion for Summary Judgment. *MeadWestvaco Corp. v. Rexam PLC*, 809 F. Supp. 2d 463 (E.D. Va. 2011). The Court granted MWV's Motion for Partial Summary Judgment as to Defendants' defenses under the theories of anticipation, obviousness, and inequitable conduct. *Id.* at 467–68. The Court denied Rexam's Motion for Summary Judgment on invalidity. *Id.* at 468. The Court granted Valois's Motion for Summary Judgment on non-infringement under the doctrine of equivalents but denied Valois's Motion for Summary Judgment on (1) literal infringement as to the New tube; (2) direct infringement, contributory infringement, and induced infringement with respect to both the Old tube and New tube; (3) willful infringement; and (4) invalidity as to the indefiniteness of the term “quenched.” *Id.* at 468–69.

On August 26, 2011, after withdrawing its claims against Defendants for damages arising from past infringement of the patents-in-suit and electing to pursue equitable relief and attorney fees under 35 U.S.C. §§ 283 and 285, MWV moved the Court to find that no jury trial right existed as to issues remaining in the case under Federal Rule of Civil Procedure 39(a). Following Federal Circuit precedent in *Tegal* and its progeny, the Court granted MWV's motion on August 31, 2011. *See Tegal Corp. v. Tokyo Electron Am., Inc.*, 257 F.3d 1331, 1339–41 (Fed. Cir. 2001). Thereafter, beginning September 7, 2011, the Court conducted a nonjury trial on the remaining issues in the case, including literal infringement, direct infringement, contributory infringement, induced infringement, attorney fees under 35 U.S.C. § 285, and permanent injunction under 35 U.S.C. § 283. The findings of fact and conclusions of law are set forth in detail below.

III. FINDINGS OF FACT

The Court makes the following findings of fact based on the evidence and testimony admitted during trial.

A. The Parties

Plaintiff MeadWestvaco Corporation is a company incorporated under the laws of the State of Delaware and has its principal place of business in Richmond, Virginia. Second Am. Compl. ¶ 4. In July 2006, MeadWestvaco Corporation acquired Saint-Gobain Calmar (“Calmar”), a division of Saint-Gobain Company (“Saint-Gobain”). MWV Ex. 959. Calmar, thereafter, became MeadWestvaco Calmar, Inc. (“MWV Calmar”), a wholly-owned subsidiary of MeadWestvaco Corporation. MWV Calmar is a company incorporated under the laws of the State of Delaware, with its principal place of business located in Grandview, Missouri. Second Am. Compl. ¶ 5. MWV Calmar is listed as the assignee of the two asserted patents in this case. U.S. Patent No. 7,718,132, at [73] (filed Oct. 9, 2006); U.S. Patent No. 7,722,819 at [73] (filed Oct. 11, 2005). Plaintiffs MeadWestvaco Corporation and MWV Calmar are collectively referenced as “MWV.”

Defendant Rexam America is a corporation organized under the laws of the State of Delaware, having a place of business in Charlotte, North Carolina. Second Am. Compl. ¶ 7; Rexam’s Answer at 2. Defendant Rexam France is a French corporation having a place of business in Le Tréport, France. Second Am. Compl. ¶ 6; Rexam’s Answer at 2. Defendants Rexam America and Rexam France are collectively referenced as “Rexam.”

Defendant Valois France is a French corporation having a place of business in Le Neubourg, France. Second Am. Compl. ¶ 8; Valois’s Answer at 2. Valois France is a wholly-owned subsidiary of AptarGroup Holding S.A.S., which is a wholly-owned subsidiary of

AptarGroup International LLC, which is a wholly-owned subsidiary of AptarGroup, Inc. (“Altar”). Valois’s Answer at 7. Defendant Valois America is a company incorporated under the laws of the State of Connecticut, and it has a place of business in Congers, New York. Valois’s Answer at 2–3. Defendant Valois America is a wholly-owned subsidiary of Aptar. Valois’s Answer at 7. Defendants Valois America and Valois France are collectively referenced as “Valois.”

MWV, Rexam, and Valois are direct competitors in the business of fragrance packaging and design. *See, e.g.*, Trial Tr. 116, Sept. 7, 2011. Each company designs, manufactures, and assembles custom-made “dispenser assemblies,” *i.e.*, spray pumps with an attached dip tube, which are used to dispense fragrance. Each of these companies sells the spray pumps to its customers, fragrance houses such as Estée Lauder and Chanel, who in turn attach these pumps to the bottles of perfume, which are then sold to retailers and consumers. *See, e.g.*, MWV Ex. at 1130.

B. The Invention

The litigation focuses on the invisible dip tube that is assembled into a fragrance pump that is then sold to a fragrance house as a component of a perfume bottle. Most fragrance pumps have a small diameter dip tube that goes from the spray nozzle to the bottom of the bottle to deliver the perfume to the nozzle. MWV Ex. at 270. Ordinary dip tubes are visible within the bottle. Since the fragrance industry is driven by aesthetics, a visible dip tube is not a desirable feature of the fragrance product, especially in the high-end fragrance market. Professionals in the luxury perfume sector are interested in eliminating the dip tube because it interferes with the aesthetic appeal of the fragrance products. One approach is to make the dip tube invisible, *i.e.*, a tube that could be completely concealed within the fragrance product when fully immersed and

the pump was primed. Though Rexam and Valois had attempted to develop invisible dip tubes, it was Calmar who successfully developed the first commercially available invisible dip tube.

From late 2004 to mid-2005, scientists James Thomson, Julia DiCorleto Gibson, John Boyle, and Kevin Gray (“the inventors”) at Saint-Gobain Performance Plastics, a sister corporation of Calmar, worked on developing an invisible dip tube. The inventors searched for a material that has a refractive index similar to that of commercial perfumes, and they identified a fluoropolymer that had the physical attributes necessary for extruding the invisible dip tube. The fluoropolymer is ethylene tetrafluoroethylene (“EFEP”), manufactured by Daikin Industries of Japan (“Daikin”).

The initial batch of tubes the inventors made using EFEP was too hazy to become invisible when immersed in liquid fragrance. Trial Tr. a.m., 33, 36, Sept. 8, 2011. The inventors suspected that the haziness of the tubes was a result of a high crystalline content in the EFEP tubes. Trial Tr. a.m., 33, 36, Sept. 8, 2011. To reduce the crystalline content of the tubes, the inventors cooled them rapidly after they were extruded from the extruder, a method known as “quenching.” See Trial Tr. a.m., 37, Sept. 8, 2011.

By April 2005, the inventors were able to produce an invisible dip tube, named NoC[®], and provided a sample of the tube to Calmar. Trial Tr. 133, Sept. 7, 2011. Calmar then started showing the NoC[®] tube to potential clients, including Estée Lauder. Trial Tr. 149, Sept. 7, 2011. The inventors soon filed a provisional patent application for the invention.

C. The Patents-in-Suit

The ’132 and ’819 patents relate to a fragrance product containing a pump with a dip tube that transports the fragrance from the bottle to the sprayer. The patents disclose a fluoropolymer tube having high transparency and low crystallinity with a refractive index closely matching that

of liquid fragrance. When immersed in fragrance liquid, the dip tube becomes transparent and virtually disappears, thus enhancing the aesthetic appeal of the fragrance product.

1. Prosecution History of the Patents

On October 11, 2005, the inventors filed a provisional patent application for fragrance products with an invisible dip tube, U.S. Provisional Patent Application No. 60/725,375. *See* Rexam Ex. 371 at 33. Then in July 2006, MeadWestvaco Corporation acquired Calmar along with the rights of the pending provisional application. MWV Ex. 959 at MWV2447, MWV2449, MWV2465. On October 9, 2006, Patent Application No. 11/539,764 was filed, which eventually matured into the '132 patent. On October 10, 2006, the applicants filed a request to convert the provisional application to a non-provisional application. Rexam Ex. 371 at 33. The request was granted, and this non-provisional application, Patent Application No. 11/374,298, subsequently matured into the '819 patent.

The '298 application was published on June 7, 2007. Rexam Ex. 365. On November 14, 2008, the examiner rejected all of the pending claims in the application. Rexam Ex. 371 at 264–87. In response to the rejection, MWV's patent attorney cancelled several claims and amended some of the remaining claims on April 9, 2009. Rexam Ex. 371 at 305–26. In the Final Office Action on August 20, 2009, the examiner again rejected all pending claims. Ex. 371 at 360–71. After the patent attorney responded to the final objection, the United States Patent and Trademark Office ("USPTO") issued a Notice of Allowance for the '298 application on December 29, 2009. Valois Ex. 54 at VOA85023; Rexam Ex. 371 at 417. The '819 patent was issued on May 25, 2010. Rexam Ex. 371 at 1.

The '764 application was published on June 7, 2007. Rexam Ex. 366. On November 25, 2008, the examiner rejected all of the pending claims in the application. Rexam Ex. 370 at 238–39. In response to the rejection, MWV's patent attorney cancelled several claims and amended some of the remaining claims on April 9, 2009. Rexam Ex. 370 at 266–79. In the Final Office Action on August 20, 2009, the examiner again rejected all pending claims. Ex. 370 at 327. After the patent attorney responded to the final objection, the USPTO issued a Notice of Allowance for the '764 application on December 30, 2009. Valois Ex. 54 at VOA85193. The '132 patent was issued on May 18, 2010. Ex. 370 at 389. On the same day, MWV commenced this patent infringement lawsuit against Rexam and Valois.

2. Relevant Patent Claims

MWV's allegations against both Rexam and Valois are (1) direct infringement of claims 15 and 19 of the '132 patent; and (2) contributory infringement and inducing infringement of claim 9 of the '132 patent and claims 1 and 20 of the '819 patent. *See generally* MWV's Proposed Findings of Fact and Conclusions of Law [hereinafter MWV's PFFCL]. Claim 15 of the '132 patent provides:

A dispenser assembly for dispensing a liquid comprising:
 a transport assembly; and,
 a tube connected to the transport assembly;
 wherein the tube consists essentially of an extruded
 and quenched crystalline fluoropolymer having an
 XRD crystallinity not greater than about 13%, the
 tube has a transparency of about 80% or more, and
 the tube has a refractive index of from about 1.36 to
 about 1.38.

'132 Patent col.8 ll.14–22. Claim 19 of the '132 patent provides, "The dispenser assembly of claim 15, wherein the fluoropolymer is ethylene tetrafluoroethylene." '132 Patent col.8 ll. 56–57. Additionally, claim 9 of the '132 patent provides:

A fragrance product comprising:
a container containing liquid fragrance; and,
a dispenser assembly for dispensing the liquid fragrance comprising:
a transport assembly; and
a tube connected to the transport assembly and extending into the liquid fragrance, wherein the tube consists essentially of an extruded and quenched crystalline fluoropolymer having an XRD crystallinity not greater than about 13%, and both the tube and the liquid fragrance have a refractive index of from about 1.36 to about 1.38.

'132 Patent col.7 ll.52–60, col.8 ll.1–3. Claim 1 of the '819 patent provides:

A fragrance product comprising:
a container containing liquid fragrance; and
a dispenser assembly for dispensing the liquid fragrance comprising:
a transport assembly; and
a tube connected to the transport assembly and extending into the liquid fragrance, wherein the tube and the liquid fragrance each have a refractive index, the difference between the refractive index of the tube and the liquid fragrance is not greater than about 0.04, the tube comprises an extruded and quenched crystalline fluoropolymer having a transparency of not less than about 80% and a crystalline content not greater than about 13%, and the tube has an outside diameter within a range of about 0.25 to about 10 mm.

'819 Patent col.7 ll.41–55. Claim 20 of the '819 patent provides, "The fragrance product of claim 1, wherein the fluoropolymer material is ethylene tetrafluoroethylene (EFEP)." '819 Patent col.8 ll.47–48.

3. Key Terms and Relevant Scientific Principles¹

The litigation focuses on several key terms of the patents: extruded and quenched crystalline fluoropolymer, XRD crystallinity or crystalline content, quenching, and EFEP.

i. Extruded and Quenched Crystalline Fluoropolymer

Polymers are long chain-like molecules that have a high molecular weight, and a fluoropolymer is a polymer that includes fluorine within its chemical structure. MWV Ex. 1073 at Wilkes #4. Polymers are commonly thought of as thermoplastics or plastics. MWV Ex. 1073 at Wilkes #4. A Polymer can form solid material, but at the molecular level, the polymer molecules are in one of two phases: a crystalline phase, if the molecules have appropriate symmetry and the conditions for crystallization are promoted; and a non-crystalline or amorphous phase. *See* MWV Ex. 1074 at 13–14. A typical crystalline polymeric material contains both crystalline regions, ordered regions of molecular structure, and amorphous regions that do not have ordered crystal packing. *See* MWV Ex. 1074 at 14. Because the crystalline and amorphous phases have different physical properties, the amount of crystals in a particular polymer material affects its physical attributes. For instance, increasing the crystallinity of the polymeric material decreases its transparency and flexibility; whereas decreasing its crystallinity increases its transparency and flexibility. Trial Tr. a.m., 56, 59, Sept. 13, 2011. Therefore, a desirable transparency of a product made from a crystalline fluoropolymer can be achieved by altering the formation of the crystalline in the product.

¹ To understand the scientific principles involved in this litigation, the Court primarily consulted expert reports, expert testimony, General Area Detector Diffraction System (GADDS) Version 4.1xx User Manual, General Area Detector Diffraction System (GADDS) Version 4.0 Software Reference Manual, TOPAS 4.2 Technical Reference, TOPAS 4.2 User Manual, and a textbook entitled “Two-Dimensional X-Ray Diffraction” by Bob B. He. *See generally* Rexam Exs. 182, 184, 289, 312, 369; Valois Ex. 282; MWV Exs. 911, 1002, 1065, 1074, 1172.

Time and temperature are the most important factors in the formation of crystals in a crystalline polymer, which correlates to the material's optical properties. Trial Tr. a.m., 57, Sept. 13, 2011. There are two temperatures that are related to the formation of crystals—melting temperature (T_m) and glass transition temperature (T_g). The melting point or melting temperature of a polymer is the temperature at or above which crystals within the polymer melt or are in a liquid state. *See* MWV Ex. 1073 at Wilkes #12. The glass transition temperature of a polymer is the temperature at or below which no additional crystallization can take place. MWV Ex. 1107. The differential between the glass transition temperature and the melting temperature of a polymer is the “crystallization window” in which crystalline formation occurs. MWV Ex. 1073 at Wilkes #12. Additionally, the rate of the crystalline formation varies at different temperatures within the “crystallization window.” Trial Tr. a.m., 70, Sept. 13, 2011.

To make plastic tubes from a polymer, the raw material is heated, and the melted material then travels through a die of a specific shape to form a tube, a process known as extrusion, as illustrated in Figure 1. *See* MWV Ex. 1073 at Wilkes #5. To increase transparency of the final product, the tubes are cooled rapidly to reach below the glass transition temperature of the polymer. This process minimizes the time for crystalline formation, so that the amount of crystals in the final product is limited. The manufacturing method facilitating this process is called quenching, wherein a molten material is rapidly cooled. One method to cool the product is to extrude the tube into a tank of water, known as the quench tank, wherein the water is the cooling medium.

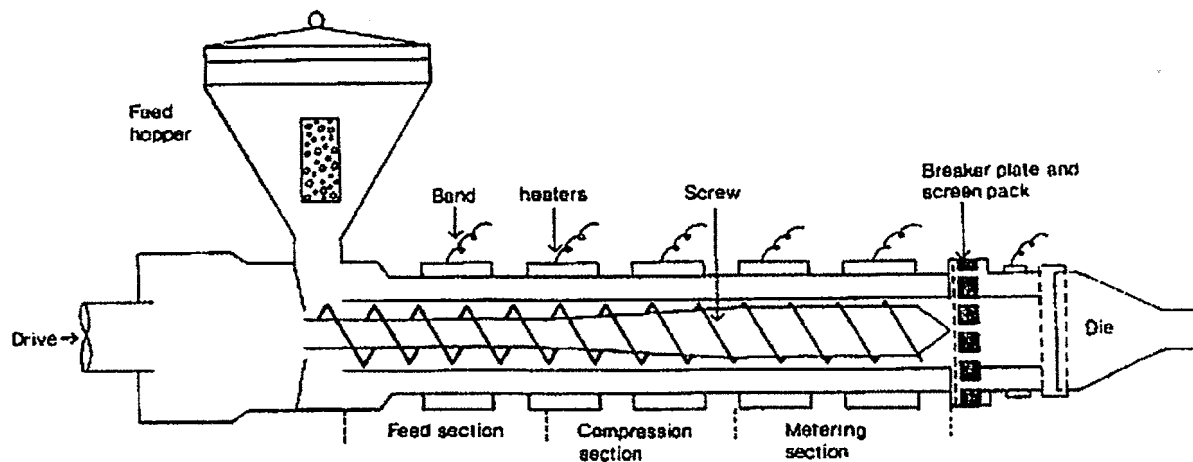


Figure 1 – Main Features of an Extruder

The specification of the '132 patent provides an example of the extrusion and quenching process:

According to a particular feature, embodiments may be produced utilizing a quenching sequence that facilitates creation of high transparency and/or low crystallinity tubes, which may take on particular significance in the context of fine dimension, thin-walled tubes as described above. In one example, EFE-4040 (modified ethylene tetrafluoroethylene) was extruded under the following conditions: Melt temperature: 520° F. to 540° F., line speed: 100 to 125 fpm, quench tank temperature: 80° F. to 90° F., distance between extruder die and quench tank: 1" to form a 1.65 mm OD, 0.95 mm ID tube.

'132 Patent col.5 ll.7–16. The Court previously determined that the term “quenched” means “rapidly cooled.” *MeadWestvaco*, 807 F. Supp. 2d at 541.

ii. X-ray Diffraction and Crystalline Content

The patents disclose an invisible dip tube with a crystalline content not greater than about 13%. The crystalline content must be qualified by X-ray diffraction ("XRD"). *Id.* at 543. XRD is conducted by striking a sample with a monochromatic X-ray beam and examining the pattern of diffracted X-rays that were emitted by the sample.

X-rays are part of the electromagnetic spectrum. MWV Ex. 1074 at 14–15. They have a short wavelength and high energy. MWV Ex. 1074 at 14–15. When the incident X-rays strike the specimen, they excite the electrons in the specimen's atomic structure. These electrons can generate their own "diffracted" X-rays that scatter from the specimen itself. MWV Ex. 1074 at 18. Typically, an X-ray with an incident angle θ strikes atoms within the specimen, resulting in scattered X-rays with the same wavelength and reflection angle as the incident beam, known as elastic scattering or coherent scattering, as illustrated in Figure 2. Rexam Ex. 182 at 3; *see also* MWV Ex. 1074 at 19. In some instances, the diffracted X-ray can have a different wavelength than the incident beam, called incoherent scattering or Compton scattering. Rexam Ex. 312 at 10.

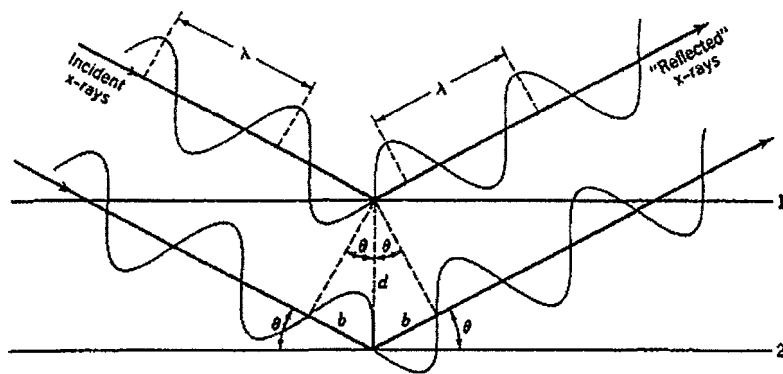


Figure 2 – Diffraction

The scattered X-rays can be detected by a detection surface, such as an X-ray film. The intensities and spatial distributions of the scattered X-rays form a specific diffraction pattern on the detection surface. This pattern is uniquely determined by the structure of the specimen. Rexam Ex. 369 at 29. When a large number of crystals oriented randomly are stricken by the incident X-ray beam, the scattered X-rays may form a series of diffraction cones, as illustrated in Figure 3. Rexam Ex. 182 at 4. These diffraction cones appear as discrete rings on a detection surface, known as “Debye rings,” as illustrated in Figure 4. *See, e.g.*, MWV Ex. 1074 at 21.

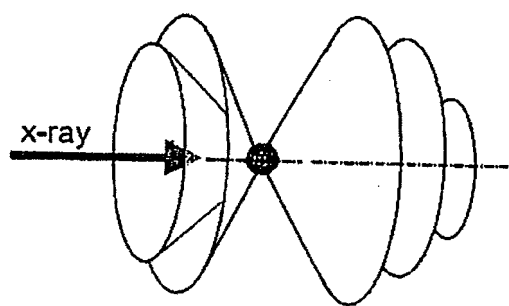


Figure 3 – Diffraction Cones

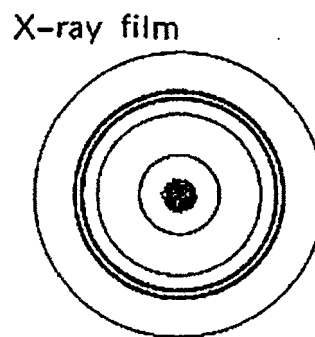


Figure 4 – Debye Rings

If the atoms in the sample are randomly placed, such as those found in an amorphous state, the diffracted X-rays are randomly diffracted in various directions to form a relatively broad amorphous “halo” on the detection surface, as illustrated in Figure 5. Rexam Ex. 369 at 386. When the sample contains amorphous regions and crystalline structures, its diffraction pattern includes both features, as illustrated in Figure 6. Rexam Ex. 369 at 386.

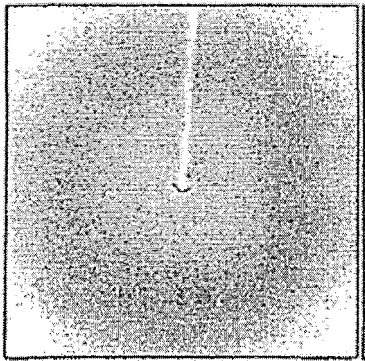


Figure 5 – Amorphous Halo

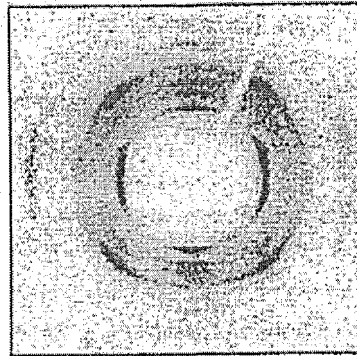


Figure 6 – Diffraction Pattern Includes Both Debye Rings and Amorphous Halo

The detection surface mentioned above may be an area detector that contains a two-dimensional array of detection elements, called pixels. *See* Rexam Ex. 369 at 123. It can simultaneously measure a two-dimensional distribution of the diffracted X-rays by intercepting and recording, or counting, the scattering X-rays, or photons, from the specimen. *See* Rexam Ex. 369 at 123. The diffraction pattern is then saved and displayed into a two-dimensional frame. As such, an area detector may also be referred to as an X-ray camera or imager. Normally, a typical area detector has limited surface area and thus limited coverage of the diffraction pattern. *See* Rexam Ex. 369 at 124. Therefore, a single frame often contains a portion of the Debye rings, which may or may not be sufficient for determining the crystalline content of the specimen.

Additionally, the detection range of the detector can be affected by the distance between the sample and the detector. The distance is related to the angular range detection frame and the resolution of the resulting image. The shorter the sample-to-detector distance, the larger the angular range; and the longer the sample-to-detector distance, the higher the image resolution. The detector in a General Area Detector Diffraction System (“GADDS”) can be set at 5 cm to 30 cm away from the sample. Rexam Ex. 312 at 15. Based on the sample-to-detector distance, one

or more frames are collected to cover the range necessary for the measurement. Rexam Ex. 312 at 15. When more than one frame is needed, the area detector can collect data in different frames or positions by moving around the specimen, in a circular direction with a radius equaling the sample-to-detector distance, as illustrated in Figure 7. Rexam Ex. 182 at 6. Normally, these frames overlap and they may be integrated into one image for further analysis.

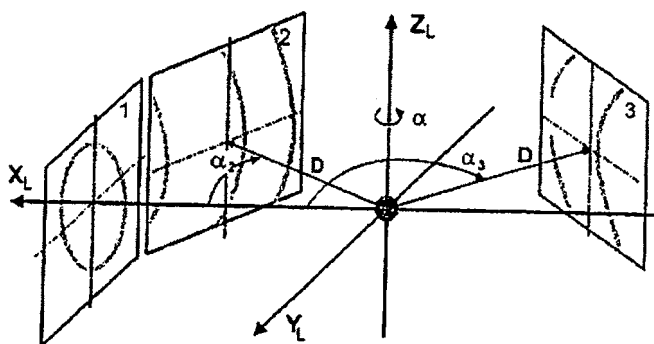


Figure 7 – Area Detector Frames

The diffraction pattern of the sample captured by the detector in a frame, or an integrated frame generated by merging overlapping frames, can be plotted as diffracted intensities of the scattered X-rays over a range of 2θ angles. A fraction of the data collected may be used to generate this plot. A plot derived from XRD data collected from crystalline solids may contain sharp peaks; however, for amorphous solids, the intensity of the scattered X-rays forms one or two maxima with a very broad distribution in the 2θ range. *See* Rexam Ex. 369 at 30–31. The diffraction pattern for amorphous solids containing crystalline structures may have a broad background from the amorphous phase and sharp peaks from the crystalline phase. *See* Rexam Ex. 369 at 30–31.

This plot can be used to determine the XRD crystallinity of a specimen, *i.e.*, percent crystallinity, which is defined as “[t]he weight percentage of the crystalline phases in a material containing both crystalline and amorphous phases.” *Rexam Ex. 369* at 385. In mathematical terms, percent crystallinity, as obtained by X-ray measurements, is the ratio of intensity from the crystalline peaks to the sum of the crystalline and amorphous intensities:²

$$\chi_{pc} = 100\% * \frac{I_{crystal}}{I_{crystal} + I_{amorphous}}$$

Where, χ_{pc} is the percent crystallinity, $I_{crystal}$ is the integrated intensity of all crystalline peaks, *i.e.*, the area under the crystalline peaks, and $I_{amorphous}$ is the integrated intensity of the amorphous scattering, *i.e.*, the area under the amorphous curve. *Rexam Ex. 369* at 386. However, some software programs, such as the GADDS Full method, can determine the crystallinity of the specimen by analyzing the entire data frame instead of the plot that may be generated from only a portion of the data in a frame.

The Court previously determined the patent terms “XRD crystallinity” and “crystalline content” both mean “crystallinity as measured by x-ray diffraction (XRD) using at least the XRD characterization parameters in the ’132 patent at column 4, line 66 to column 5, line 6.”

MeadWestvaco, 807 F. Supp. 2d at 543–44. The “XRD characterization parameters” referenced in this Court’s Claim Construction Memorandum Opinion and Order are as follows:

Voltage: 45 kV, Current: 40 mA, XRD Machine: Bruker D8 Discover w/Gadds Detector, 0.3 mm slit, 0.3 mm collimation, Cu Radiation, Goebel Mirror (parallel beams), 0.5 mm oscillation along tube length, 5 frames (~15°/frame), 72 seconds/frame, Omega=7°, midpoint for detection frames=14°, 29°, 44°, 59°, 74°.

² The General Area Detector Diffraction System (GADDS) Version 4.1xx User Manual has a similar formula. MWV Ex. 911 at 8-2.

'132 Patent col.5 ll.1–6. These parameters concern only the manner under which the XRD data is to be collected from Defendants' invisible dip tubes. The patent specification does not provide the sample-to-detector distance, nor does it specify the software for the analysis of the XRD data and the calculation of the XRD crystallinity. The GADDS detector comes with a software package for analyzing XRD data. Other commercial software packages are available such as TOPAS, which is offered by Bruker, the maker of the GADDS detector.

iii. Quenching and Crystallinity

During the development of the invisible dip tube, the inventors studied the relationship between the cooling mechanisms and transparency of the EFEP tubes. They compared the visual clarity and XRD crystallinity of the tubes with different cooling profiles. For example, some tubes were extruded from the extruder and were immediately held at a temperature of 155 °C (311 °F)³ for a period of time, ranging from one hour to several hours, a process known as annealing where the sample's temperature is held at a temperature between its critical crystallization temperature and its melting temperature. Trial Tr. p.m., 37, Sept. 20, 2011. The purpose of annealing, which is non-quenching, is to promote crystal growth in the sample. The inventors observed that there was a visible difference between the tubes that were subjected to an annealing condition and those that were not. Additionally, the XRD crystallinity of an EFEP dip tube that was not subjected to annealing was 6%, but the XRD crystallinity of the tubes increased to around or above 13% when they were subjected to an annealing condition. Rexam Exs. 95, 102. The inventors disclosed their findings in the specification of the '132 patent:

³ The Court notes that sometimes temperature data is reported in degrees centigrade (°C). When it is necessary, the Court converts the temperature measurements in degrees Celsius to degrees Fahrenheit using the online temperature converter provided by National Oceanic and Atmospheric Administration, *available at* <http://www.erh.noaa.gov/lwx/calculator.shtml> (last modified Jan. 24, 2006).

Further testing revealed that quenching was important to ensure high transparency and/or low crystallinity. Non-quenched samples of the same material were found to have crystalline contents of 18% (1 hr anneal at 155° C), 13% (5 hr anneal at 155° C), and higher (e.g., 29% and 33%). Such comparative samples were also found to be hazy, not achieving high transparency.

'132 Patent col.5 ll.16-22.

iv. Ethylene Tetrafluoroethylene (EFEP)

Ethylene tetrafluoroethylene, EFEP, is a crystalline fluoropolymer that contains both crystalline regions and amorphous regions. It is a type of thermoplastic and can be heated then reshaped as a melt. Compared to other fluoropolymers, EFEP has a lower molding temperature and better melt flow properties. Rexam Ex. 1 at 10.

EFEP is manufactured by Daikin, and there are at least three grades of the EFEP resin: EFEP RP-4020, EFEP RP-4040, and EFEP RP-5000. All of them are suitable for making tubing via extrusion. Rexam Ex. 1 at 4, 10. EFEP RP-4020 and RP-4040 have a very low processing temperature, good thermal stability, high transparency, and good chemical resistance. Rexam Ex. 16 at 1. Both the melting temperature of EFEP RP-4020 and RP-4040 is 165 °C (329 °F). The melting temperature of EFEP RP-5000 is 195 °C (383 °F). Rexam Ex. 1 at 6. The glass transition temperature of EFEP RP-4020 is 50 °C (122 °F).⁴ Rexam Ex. 1 at 6. EFEP RP-5000 has a higher XRD crystallinity than EFEP RP-4040. Rexam Ex. 102 at 2. Currently, diffraction profile of EFEP is not available in the database published by the International Center for Diffraction Data ("ICDD").

⁴ The glass transition temperature of EFEP RP-4040 is not available from Daikin. Rexam Ex. 1 at 6. Additionally, Mr. Jeffery Hawley of Zeus claimed that the glass transition temperature of EFEP used by Zeus to produce dip tubes for Valois is [REDACTED]

D. Defendants' Products

1. Rexam's V1 Tube

When Calmar started marketing the NoC[®] tube in late 2005, it gave samples to potential clients, including Estée Lauder.⁵ Rexam obtained a sample of Calmar's pump and dip tube from Estée Lauder. MWV Ex. 514; Trial Tr. p.m., 35, Sept. 26, 2011. Rexam analyzed the sample and determined that it was made from a fluoropolymer. Trial Tr. a.m., 36–38, Sept. 26, 2011. Rexam then sought and obtained the commercially available EFEP RP-4020 resin from Daikin America. Trial Tr. a.m., 37–38, Sept. 26, 2011. Rexam directed its tube manufacturer, Markel Corporation ("Markel"), which had experience with extruded fluoropolymer tubes, to manufacture dip tubes using the EFEP resin. Trial Tr. a.m., 39–40, Sept. 26, 2011. In April 2006, Markel produced the first sample invisible tube for Rexam. Subsequently, in May 2006, Rexam launched its invisible dip tube, the V1 tube, at the Luxe Pack show in New York. Trial Tr. 151, Sept. 7, 2011.

On October 23, 2006, Rexam filed a patent application in France (No. 06 09284) covering an invisible dip tube. MWV Ex. 1040. The patent application listed five Rexam employees as inventors and claimed a "[b]ottle incorporating an alcoholic perfume solution . . . characterized in that the dip tube . . . is manufactured in a fluorinated polymer-based material." MWV Ex. 1040 at RXFrance009092. The invention sought to "allow industrial-scale production of a bottle with different characteristics, which contribute to making at least the dip tube invisible in the alcoholic perfume solution." MWV Ex. 1040 at RXFrance009085. On October 22, 2007, Rexam filed a U.S. counterpart of the French application claiming priority to the French application. Trial Tr. p.m., 72–73, Sept. 26, 2011. On January 30, 2009, the French patent application became French Patent No. 2907320. MWV Ex. 1040 at RXFrance009066.

⁵ The Court notes that Estée Lauder was not subject to a confidentiality agreement with Calmar.

2. Rexam's V2 Tube

In 2008, Rexam learned that all relevant claims in MWV Calmar's patent applications included the limitation that the XRD crystallinity of the dip tube is not greater than 13%. Starting in May 2009, Rexam worked with Markel to develop a fluoropolymer dip tube that has an XRD crystallinity higher than 13%. MWV Ex 14. Tareq Al Ahmed, a project manager at Rexam, led this project. Rexam directed Markel to experiment with modifying the manufacturing process of the V1 tubes, such as changing the temperature of the quench tank and stretching the tube. *See, e.g.*, MWV Ex 26. Other alternative approaches that were tested included additives, gamma radiation, and nucleating agents. *See, e.g.*, MWV Ex 3.

In January 2010, upon learning that a different grade of EFEP made by Daikin, EFEP RP-5000, is less transparent in alcohol than EFEP RP-4020, Rexam directed Markel to manufacture dip tubes from a blend of EFEP RP-5000 and EFEP RP-4020 resin. The 30% EFEP RP-5000 and 70% EFEP RP-4020 blend was ultimately selected for trials in February 2010. Trial Tr. a.m., 95, Sept. 26, 2011. The new version of Rexam's invisible dip tube, V2, was put into production in March 2010. MWV Ex. 6 at 3.

During the development of the V2 tube, Rexam conducted tests, including tests for dip tube retention and stiffness, to determine the differences between the V1 and V2 tubes. Rexam found the V2 tube suitable to replace the V1 tube because the V2 tube performed better than the V1 tube in terms of dip tubing retention and was less prone to kinking when inserted into the pump. Trial Tr. a.m., 98, Sept. 26, 2011. After MWV filed the present lawsuit, Rexam retained Dr. Richard Ortega to determine the XRD crystallinity of the V2 tube. Rexam Ex. 312.

On February 3, 2010, Rexam filed a U.S. Provisional Patent Application 61/301,108 naming Tareq Al Ahmed as inventor. MWV Ex. 1041. The application, entitled "Transparent Fluoropolymer Dip Tubes For Use In Fragrance Pumps," disclosed dip tubes that were "substantially transparent within alcohol-based liquids such as fragrances." MWV Ex. 1041 at RXB161003. These tubes "may be made from a blend of fluoropolymers" having a resulting refractive index similar to that of fragrances. MWV Ex. 1041 at RXB161006. It mentioned that the crystallinity of the dip tubes "may be about 18% or more, 25% or more, or about 30% or more." MWV Ex. 1041 at RXB161008. Rexam's provisional application further described that the dip tubes has improved stiffness, decreased creasing and kinking, increased dip tube retention, increased strength of the polymer/polymer interface, and/or reduced elongation. MWV Ex 1041 at RXB161005.

3. Valois's Old Ultimate® Tube

Valois learned about Calmar's invisible tube from a customer in March 2006. In May 2006, Valois began research and development for its version of the invisible dip tube. Two material engineers at Valois, Helene Chevalier and Thomas Clemence, searched for an appropriate material for extruding invisible dip tubes. Based on information provided by Pfeiffer, Valois's sister company, the engineers searched for material with the refractive index similar to that of fragrances. *See* MWV Ex. 78. After testing refractive indices for about twenty fragrance products, the engineers found that the average refractive index of the fragrance products ranged from 1.37 to 1.38. Trial Tr. a.m., 75, Sept. 27, 2011. They searched the Prospector database, a world materials database, for material with a refractive index close to that of fragrances. Their search efforts led to fluoropolymers, but the results did not include EFEP.

Valois does not make dip tubes. Nor does it have expertise in extruding dip tubes. In July 2006, Valois worked with Zeus Industrial Products Incorporated (“Zeus”), a tube supplier, to develop an invisible dip tube. In October 2006, Valois sent Zeus the NoC[®] tube obtained from a sales outlet. Zeus analyzed the NoC[®] tube and determined that it was made from fluoropolymers and recommended that Valois try EFEP from Daikin. Zeus successfully manufactured invisible dip tubes from EFEP resin at its facility in Ireland, employing a process referred to as the water-quenched process where the extruded tube was immersed in water to cool. The speed at which the tubing traveled during production was as high as 160 feet per minute. Trial Tr. p.m., 4, Sept. 20, 2011. In May 2007, Valois launched its version of the invisible dip tube, named Ultimate[®], at the Luxe Pack show in New York. Trial Tr. p.m., 106–07, Sept. 14, 2011.

4. Valois’s New Ultimate[®] Tube

Valois was informed about the Notices of Issuance regarding MWV’s pending patent applications in late 2009. Trial Tr. a.m., 57–58, Sept. 14, 2011. Valois worked with one of its two dip-tube suppliers, Zeus, to find a technical solution to get around the upcoming patents because the other tube supplier, Tekni-Plex, was also working with Rexam. Around March 5, 2010, Alexandra Parmentier of Valois⁶ traveled to Zeus’s factory in Orangeburg, South Carolina, to meet with Zeus personnel and discussed Valois’s proposed options for avoiding the pending MWV patents. Trial Tr. a.m., 59–60, Sept. 14, 2011. These options included extruding without quenching, using a different grade of EFEP with higher crystallinity, and making a square shaped tube instead of a cylindrical shaped tube. *See, e.g.*, MWV Ex. 41. Zeus considered extruding

⁶ Valois’s parent company, Aptar, underwent a reorganization in 2010. Ms. Parmentier currently is the President for Global Market Development at Aptar.

without quenching the best option. Valois Ex. 171. Approximately two to three weeks later, Zeus provided a sample of an allegedly unquenched tube to Valois.

To verify that the New tube was unquenched, Valois sought from Zeus temperature data during the new manufacturing process. MWV Ex. 149. In a letter dated April 15, 2010, Zeus provided temperature comparison data to Valois as follows:

Extrusion Type	Temperature at Extrusion Head	Temperature Two (2) Inches from Extruder Head	Temperature Eight (8) Feet from Extruder Head
Quenched	415 – 425 °F / 212.8 – 218.3 °C	70 – 75 °F / 21.1 – 23.9 °C	70 – 75 °F / 21.1 – 23.9 °C
Unquenched	415 – 425 °F / 212.8 – 218.3 °C	280 – 300 °F / 137.8 – 148.9 °C	100 – 115 °F / 37.8 – 46.1 °C

Valois Ex. 142. Without giving specific details, Zeus revealed to Valois that it no longer used water to cool the tube, and the tube was being cooled through air. Valois Ex. 142. As a result, the new process ran at [REDACTED] which was slower than the old process. Valois Ex. 282 at 22; Trial Tr. p.m., 4, Sept. 20, 2011. Additionally, the New tube was hazier and softer than the Old tube, and its dimensions were not as good as that of the Old tube. See MWV Ex. 153. Furthermore, due to the lower line speed during production, the New tube was about three times more expensive than the Old tube. See MWV Ex. 153.

After this lawsuit was commenced, Ms. Parmentier sought to visit Zeus's facility for proof that the New tube was unquenched. Valois proposed three options: (1) Valois would send an independent third party, a *huissier*, to visit Zeus's facility and certify that the New tube was unquenched; (2) Ms. Parmentier would visit Zeus's facility and certify that the New tube was unquenched; and (3) a high-level executive from Zeus would certify that the New tube was not quenched. MWV Ex. 363. Zeus did not allow outside visitors to have access to its manufacturing process due to confidentiality concerns. See Trial Tr. a.m., 67, Sept. 20, 2011.

Instead, Zeus certified that “[s]ince the 19th of May 2010, the extrusion process is ‘unquenched.’” MWV Ex. 363 at VFR0001414. Zeus continued to resist inquiries concerning the new production process during the discovery stage of this litigation. Only after the United States District Court for the District of South Carolina, where Zeus’s headquarters is located, ordered Zeus to produce relevant documents did it produce additional details regarding its manufacturing process for the New tube.

In the process for manufacturing the New tube, the raw material is first melted and extruded through an extruder. Then, the tubing [REDACTED] [REDACTED] Valois Ex. 168; *see also* Valois Ex. 282 at 23. [REDACTED] Trial Tr. a.m., 44, Sept. 20, 2011.

[REDACTED] Valois Ex. 282 at 23. [REDACTED] [REDACTED] Trial Tr. a.m., 42, Sept. 20, 2011. [REDACTED] [REDACTED] Trial Tr. p.m., 4, Sept. 20, 2011.

Zeus provided temperature data regarding the extrusion and cooling process of the New tube in one of its cooling tanks. [REDACTED] [REDACTED] [REDACTED]⁷ Trial Tr. p.m., 56–58, Sept. 8, 2011. [REDACTED] [REDACTED] Trial Tr. p.m., 43, 83, Sept. 8, 2011. [REDACTED]

⁷ [REDACTED]

See Valois Ex. 282 at 23.

Trial Tr. p.m., 49–50, Sept. 8, 2011.

See Valois Ex. 282 at 23.

E. The Fragrance Pump Industry

All parties in this litigation are major participants and direct competitors in the worldwide fragrance pump market. Each supplies fragrance pumps containing a dip tube to fragrance houses, which incorporate the pumps into their fragrance products. The fragrance pump market is closely associated with the international fragrance market in which the participants are fragrance houses. There are three levels in the fragrance market: (1) top-level fragrances, or prestige brands, include brands such as Chanel and Burberry; (2) mid-level brands, or masstige brands, include Bath and Body Works, Victoria's Secret, Banana Republic, and Gap; and (3) lower-level or mass production products include those sold at discount stores and outlets. Trial Tr. a.m., 118-19, Sept. 12, 2011.

In terms of the worldwide sale of customized spray pumps for premium brands, Valois has the biggest market share followed by Rexam and MWV. *See, e.g.*, MWV Ex. 1121. Being the three major players in the fragrance-packaging business, MWV, Rexam, and Valois are engaged in fierce competition. It is a common practice for each of them to evaluate its competitors' products and submit competing bids to fragrance houses. Additionally, the fragrance houses may have more than one pump supplier, and they may also encourage pump suppliers to come up with competitive products.

In general, fragrance pumps are customized products. Factors fragrance houses often consider in selecting a pump supplier include price, quality, aesthetics, and supply. Trial Tr. a.m., 114, Sept. 12, 2011. The pump selection process for a particular fragrance product can be lengthy and extensive. In particular, the selection process includes a qualification process to ensure all of the components of the bottle and the pump fit together and the pump does not affect the formula of the fragrance product or its scent. Trial Tr. a.m., 115-16, Sept. 12, 2011. Additionally, after the pump and the supplier are selected, extensive and lengthy line trials are conducted at the production line of the fragrance manufacturer's place of production, using the sample pumps from the supplier. If approved by a particular fragrance house for a particular product, the supplier can be considered by the same client for future fragrances and other beauty products. Trial Tr. a.m., 125-26, Sept. 12, 2011. Similarly, when a supplier loses the direct sale of the pump, it also loses the opportunity to be considered for other beauty products of the same line. Trial Tr. a.m., 125-26, Sept. 12, 2011. It is difficult to win a brand that is already qualified on a competitor's product. However, it is comparatively easy to win and hold an account with which the supplier has an established business relationship, or when a fragrance house launches a new brand. Trial Tr. a.m., 125-26, Sept. 12, 2011.

F. Invisible Tubes in the Marketplace

Since the initial launch of the invisible dip tube in 2006, the fragrance industry has reacted positively toward the product, which allows for the rapid formation of a fast-growing segment of the overall fragrance pump market, with the three parties as the only competitors. *See, e.g.*, MWV Exs. 64, 352, 759. As shown in Figure 8, the key players in this segment of the market are as follows: (1) Daikin is the sole manufacturer for the raw material, EFEP resin, used to extrude the invisible dip tubes; (2) Saint-Gobain, Zeus, and Markel are dip tube suppliers for

MWV, Valois, and Rexam, respectively; (3) MWV, Valois, and Rexam attach the tubes to their pumps and sell them to fragrance houses; and (4) fragrance houses incorporate the pumps into their perfume bottles and distribute them to their retail customers worldwide. *See* MWV Ex. 1130.

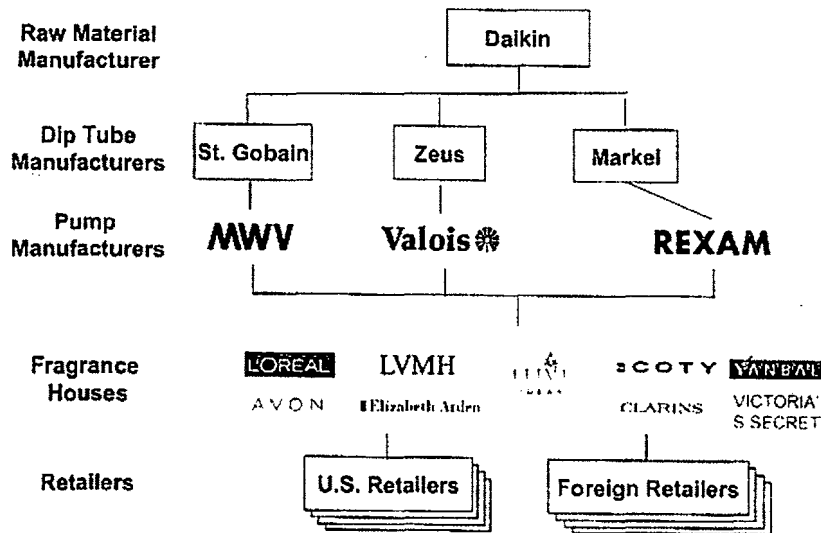


Figure 8 – Key Players in Relevant Market

Rexam America assembles and sells its pumps to U.S. customer locations; whereas Rexam France does not sell or deliver pumps containing an invisible dip tube to its customers in the United States. Trial Tr. p.m., 13–15, Sept. 26, 2011; *see also* MWV Ex. 526 at RXB012344. However, Rexam France knows that some of its customers, such as LVMH and Shiseido, import their fragrance products into the United States. Trial Tr. p.m., 66–67, Sept. 19, 2011.

Valois France supplies the invisible dip tubes to Valois America. Trial Tr. p.m., 92, Sept. 19, 2011. Valois America assembles and sells the pumps to its customers in the U.S. market. Valois Ex. 258 at 10. Valois France does not sell pumps with invisible dip tube in the U.S. market. However, Valois France knows that some of its customers, such as Guerlain, import

their fragrance products into the United States. Trial Tr. p.m., 89, Sept. 19, 2011. Nonetheless, there is no detailed information available regarding the quantity of the fragrance products containing pumps with an invisible tube that were imported to the United States by Defendants' clients.

Rexam and Valois also addressed their clients concerns regarding MWV Calmar's patent applications. Soon after its patent applications were published in June 2007, MWV Calmar wrote to fragrance houses, such as Chanel and Mary Kay, informing them about its patent applications. *See, e.g.*, Valois Exs. 127, 128. These letters warned the companies about MWV Calmar's rights to seek an injunction or monetary damages should any patent be granted. In response to their customers' inquiries about the patent rights related to the invisible tube technology, Valois and Rexam provided indemnification agreements or assurance letters to some of their clients. *See, e.g.*, MWV Exs. 232, 1023, 1101.

The invisible dip tube is a commercial success. Targeting the prestige brands and the premium masstige level brands in the fragrance market, the invisible dip tube is several times more expensive than the ordinary dip tube. Nonetheless, the demand for the product has risen rapidly. The worldwide sale of pumps containing an invisible dip tube has grown rapidly from 2007 to 2010. Specifically, MWV's sales increased from approximately 5.4 million units in 2007 to around 17.4 million units in 2010; Rexam's sales increased from approximately [REDACTED] units in 2007 to around [REDACTED] units in 2010, which includes about [REDACTED] units sold by Rexam France; and Valois's sales [REDACTED] 2010, which includes [REDACTED] sold by Valois France alone. MWV Exs. 1122, 1125; Valois Ex. 267. Though all three players experienced market gains,

Valois, achieving the highest market gain, became the dominant participant in sales of pumps with an invisible dip tube in 2010.

However, not all fragrance products of the premium brands contain pumps with an invisible dip tube. For example, Estée Lauder Beautiful, Estée Lauder Pleasures, Calvin Klein CK1, and Ralph Lauren Polo are product lines that use regular visible dip tubes that are made from material such as polypropylene or polyethylene. Trial Tr. p.m., 10, Sept. 26, 2011. One of the reasons for not choosing pumps containing an invisible dip tube for these fragrance products is that the appearance of the bottles makes the use of the invisible dip tube unnecessary, *i.e.*, where the bottle is frosted, opaque, or otherwise not transparent. Trial Tr. p.m., 7-10, Sept. 26, 2011. Additionally, invisible tubes cost significantly more than regular dip tubes—normal crystal tubes are priced [REDACTED] per thousand units; whereas invisible tubes could cost as [REDACTED] per thousand units. *See, e.g.*, Trial Tr. a.m., 118, Sept. 12, 2011.

Moreover, sales of pumps containing an invisible dip tube remain relatively minor compared to sales of pumps containing a regular dip tube. For example, in 2010, [REDACTED] of the units sold by Rexam contained invisible tubes, which accounted for [REDACTED] of the value of total units sold by the company. Rexam Ex. 350. Thus, the invisible dip tube is considered by some in the business as a niche product. Trial Tr. p.m., 28-29, Sept. 26, 2011; *see also* Valois Ex. 285 at 2.

G. Post-issuance Sale of Defendants' Products

As a result of its design-around efforts as stated above, each Defendant made a new version of its invisible dip tube, Rexam's V2 tube and Valois's New tube, and began to sell it exclusively before or around the time of the issuance of the patents-in-suit with a few exceptions. Specifically, Rexam America stopped selling any products containing the V1 dip tube on May 17, 2010. *See* Rexam Ex. 418 at 3; Rexam Ex. 527 at 1. Then, Rexam America isolated all V1

tubing by placing them in boxes in a designated area of the factory, and they were eventually destroyed in October 2010. Rexam Ex. 418 at 2. However, Rexam France made additional sales of the pumps containing the V1 tube after the patents were issued. Vincent Raby, Rexam's Vice President of Global Product Development, instructed that the customers be informed that if they chose to receive these pumps after the patents were issued, they should only distribute their fragrance products containing the pumps outside the United States. Trial Tr. p.m., 14, Sept. 26, 2011. Additionally, Rexam America and Rexam France have sold pumps containing the V2 tube since spring of 2010. Trial Tr. p.m., 81, Sept. 26, 2011.

After the production of the New tube started in May 2010, Valois created a specific code for this new tube so that when new orders of pumps were generated, only the new code would be used by its inventory system. Valois Ex. 259. Personnel involved in the supply chain, the purchasing departments, and the production as well as the sales people, were informed of the change from the Old tube to the New tube. However, both Valois America and Valois France sold pumps containing the Old tube after the patents were issued. Valois Ex. 267. Additionally, Valois America and Valois France have sold pumps containing the New tube since June 2010. Valois Ex. 267.

IV. CONCLUSIONS OF LAW

Based on the findings of fact stated above, and with additional facts added when necessary below, the Court makes the following conclusions of law.

A. *Literal Infringement*⁸

The Court finds that (1) the XRD crystallinity of Rexam's V1 tube is not greater than about 13%; (2) the XRD crystallinity of Rexam's V2 tube is not greater than about 13%; (3) fragrance pumps containing Rexam's V1 or V2 tube fall within the scope of claims 15 and 19 of the '132 patent; (4) Valois's New tube is quenched; (5) fragrance pumps containing Valois's New tube fall within the scope of claims 15 and 19 of the '132 patent; and (6) fragrance products containing Defendants' pumps with their invisible tubes, Rexam's V1 and V2 tubes as well as Valois's Old and New tubes, fall within the scope of claim 9 of the '132 patent and claims 1 and 20 of the '819 patent.

"Literal infringement requires that each and every limitation set forth in a claim appear in an accused product." *Cross Med. Prods., Inc. v. Medtronic Sofamor Danek, Inc.*, 424 F.3d 1293, 1310 (Fed. Cir. 2005). "A determination of infringement involves two steps: First, the court determines the scope and meaning of the asserted patent claims. The court then compares the properly construed claims to the allegedly infringing device to determine whether all of the claim limitations are present" *Innovention Toys, LLC v. MGA Entm't, Inc.*, 637 F.3d 1314 (Fed. Cir. 2011) (citing *Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1454 (Fed. Cir. 1998) (*en banc*)). The first step, claim construction, "is a question of law and requires the court to determine the proper construction of the asserted claims." *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976 (Fed. Cir. 1995) (*en banc*), *aff'd*, 517 U.S. 370 (1996). The second step,

⁸ The Court finds that Defendants' products literally infringe the '132 patent; therefore, the Court need not address the issue of infringement under the doctrine of equivalents.

infringement, “is a question of fact and requires a determination that every claim limitation . . . be found in the accused device.” *Planet Bingo, LLC v. GameTech Int’l, Inc.*, 472 F.3d 1338, 1341 (Fed. Cir. 2006). “To establish literal infringement, ‘every limitation set forth in a claim must be found in an accused product, exactly.’” *Becton, Dickinson & Co. v. Tyco Healthcare Grp.*, 616 F.3d 1249 (Fed. Cir. 2010) (quoting *Southwall Techs., Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1575 (Fed. Cir. 1995)). The comparison is only to the patent claims, not to any specific embodiment in the patent specification. *See Amgen Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1347 (Fed. Cir. 2003).

The asserted claims essentially describe a fragrance pump containing a dip tube consisting of “an extruded and quenched crystalline fluoropolymer” having “a crystalline content not greater than about 13%.” Rexam’s non-infringement defense is focused on the issue of whether Rexam’s tube comprises a fluoropolymer having an XRD crystallinity that is not greater than about 13%; whereas Valois’s non-infringement defense is focused on the issue of whether the New tube is quenched. The Court discusses the two issues below.

1. Rexam’s V1 Tube and V2 Tube

The Court finds that the XRD crystallinity of Rexam’s V1 tube is not greater than about 13%. The Court further finds that the XRD crystallinity of Rexam’s V2 tube is not greater than about 13%. Consequently, the Court finds that Rexam’s pumps containing either the V1 or V2 tube fall within the scope of claims 15 and 19 of the ’132 patent. The focus at trial with respect to Rexam’s tubes was whether their XRD crystallinity exceeded 13%. The issue litigated at trial with respect to proving percent crystallinity was whether the testifying experts properly followed the patent when testing the dip tube samples.

The Court has previously determined the patent terms “XRD crystallinity” and “crystalline content” both mean “crystallinity as measured by X-ray diffraction (XRD) using at least the XRD characterization parameters identified in the ’132 patent at column 4, line 66 to column 5, line 6.” *MeadWestvaco*, 807 F. Supp. 2d at 543. The “XRD characterization parameters” are:

Voltage: 45 kV, Current: 40 mA, XRD Machine: Bruker D8 Discover w/Gadds Detector, 0.3 mm slit, 0.3 mm collimation, Cu Radiation, Goebel Mirror (parallel beams), 0.5 mm oscillation along tube length, 5 frames (~15°/frame), 72 seconds/frame, Omega=7°, midpoint for detection frames=14°, 29°, 44°, 59°, 74°

’132 Patent col. 5 ll. 1–6. The parameters concern only the manner under which the XRD data is to be collected for the accused product. Notably, the patent specification does not provide the sample-to-detector distance. Nor does it specify the software for the analysis of the XRD data and the calculation of the XRD crystallinity.

Both MWV and Rexam retained experts to test Rexam’s dip tubes. The experts, Dr. Joseph Reibenspies for MWV and Dr. Ortega for Rexam testified at trial. Rexam retained Dr. Ortega, an expert in XRD testing and crystallography with over twenty-five years of experience. Dr. Ortega tested samples of Rexam’s V2 tube and determined that the V2 tube had an XRD crystallinity of approximately 23-24%, which is greater than 13%. Dr. Ortega testified as to the process by which he tested Rexam’s V2 tubes, and asserted that his testing mirrored the characterization parameters set out in the ’132 patent. Additionally, Dr. Ortega set his sample-to-detector distance at 15 cm. To analyze his XRD data, he used a newly purchased software package, TOPAS, from Bruker, the maker of the GADDS system.

The Court dismisses Dr. Ortega's test results for two reasons. First, Dr. Ortega's results are unreliable because they were obtained from analysis of XRD data that is not statistically significant. Dr. Reibenspies explained at trial that the XRD detector receives and counts the number of X-rays (*i.e.*, photons) striking the detector during an XRD experiment. He further explained that the detector has one million pixels, and only if a sufficient number of photons were collected per frame, would the data be in the statistically significant range and suitable for analysis. Moreover, Dr. Reibenspies opined that XRD data that is not statistically significant causes problems with the subsequent analysis of the data and the ultimate result of XRD crystallinity. Trial Tr. a.m., 81–82, Sept. 19, 2011. Notably, Dr. Ortega's data reveals a photon count around or less than 500,000 per frame (*i.e.*, on average, less than 0.5 counts per pixel), which is below the threshold that Dr. Reibenspies considered to be required for XRD data to be statistically significant. MWV Ex. 1065 at 10.

Moreover, Dr. Ortega acknowledged that his data was not statistically significant because he did not collect his data for a sufficient length of time at his chosen sample-to-detector distance. Dr. Ortega set the sample-to-detector distance to 15 cm. He then collected data for seventy-two seconds as required by the patents, even though he knew that he should have collected the XRD data for 300–600 seconds at 15 cm for the data to be statistically significant. Rexam Ex. 312 at 20. Thus, both Dr. Ortega and Dr. Reibenspies agree that Dr. Ortega's data is not statistically significant. It follows that Dr. Ortega's XRD data is not suited for analysis and the XRD crystallinity results derived from the data are unreliable.⁹

⁹ After reviewing Dr. Ortega's report, Dr. Reibenspies submitted a supplemental expert report discussing Dr. Ortega's tests and the results. Dr. Reibenspies used Dr. Ortega's method to retested one V2 tube and determined that the XRD crystallinity of the V2 tube is around 6%. MWV Ex. 1065. The Court dismisses this result because the data Dr. Reibenspies collected is not statistically significant as it shows even less total photon counts than did Dr. Ortega's results. MWV Ex. 1065 at 10.

Second, as a new user of TOPAS, Dr. Ortega allowed an important parameter, “m,” to be at a value that is ordinarily outside the default range as defined by TOPAS Technical Reference without adequate justification, resulting in an artificially high XRD crystallinity. Dr. Ortega purchased the TOPAS package about a month before using it to analyze XRD data collected from the V2 tubes. Trial Tr. a.m., 74, Sept. 28, 2011. Furthermore, Dr. Ortega, who never used TOPAS before he purchased the software, admitted that he did not read the user manual. Trial Tr. a.m., 74, Sept. 28, 2011. Nonetheless, he proceeded to use TOPAS to analyze his XRD data, which he knew, as explained above, was not statistically significant.

TOPAS allows the user to set the value of “m,” a peak parameter, which affects the tails of the crystalline peaks and defines the overall shape of these peaks. Generally, the smaller the “m” value the broader the tail of the crystalline peak, and the bigger the crystalline intensity, which is defined as the area under the peak. *See* Rexam Ex. 369 at 314. The TOPAS Technical Reference provides for a range of “m” between 0.75 and 30. MWV Ex. 1002 at 9–10. Dr. Reibenspies opined that no one who is skilled running TOPAS would set “m” to a value outside the range. Trial Tr. p.m., 23, Sept. 15, 2011. However, Dr. Ortega allowed the “m” value to be set at 0.55 by adjusting the default limits to the value to between 0.5 and 0.75. Trial Tr. p.m., 6, Sept. 28, 2011. This resulted in a higher value for the crystalline peaks, which in turn artificially increased the XRD crystallinity of the sample. Dr. Ortega testified that only experts would adjust the default limits to the “m” value. Trial Tr. p.m., 6–8, Sept. 28, 2011. Dr. Ortega’s justification is belied by the fact that he was not a seasoned user of the TOPAS software, yet he failed to follow the ordinary course in using the software. Therefore, the Court finds that Dr. Ortega’s XRD testing and analysis of Rexam’s V2 tubes were flawed and that the results in his report are unreliable.

MWV retained Dr. Reibenspies, an expert witness in X-ray diffraction, who testified that the XRD crystallinity of Rexam's tubes is not greater than about 13%. Dr. Reibenspies is a professor and senior researcher at Texas A&M University whose concentration is on XRD testing and equipment. Dr. Reibenspies analyzed one V1 tube (labeled "A1") and three V2 tubes (labeled "R₁", "R₂", and "R₃") using XRD. Trial Tr. a.m., 15–16, Sept. 15, 2011. Dr. Reibenspies determined that the XRD crystallinity of Rexam's V1 tube was 8.206% and the XRD crystallinity of the three V2 tubes were 9.074%, 8.619%, and 8.500%. Rexam Ex. 182 at 28.

Dr. Reibenspies testified and described the process by which he tested the accused Rexam tubes. *See* Rexam Ex. 298. Dr. Reibenspies set the sample-to-detector distance at 5 cm, and he followed the XRD characterization parameters except that he (1) used a graphite monochromator with a fixed slit instead of 0.3 mm collimator and Gobel mirror; and (2) did not oscillate the sample during testing because his instrument did not have the oscillation feature. However, he took the following steps to accommodate for the oscillation requirement. First, he collected one frame of XRD data at 14°. Second, he repositioned the sample by manually moving the sample 0.5 mm along the tube's length and collected another frame. Third, he merged the two frames and obtained an average reading of the two position settings. He repeated the same steps for the remaining frames at 29°, 44°, 59°, and 74°. Additionally, he changed the sample-to-detector distance from 5 cm to 15 cm for the frame taken at 74° because his GADDS system included devices that would interfere with taking the fifth frame at the 5 cm sample-to-detector distance. Finally, to analyze the XRD data and calculate the XRD crystallinity of each tube, Dr. Reibenspies used the GADDS Full method, part of the software package that came with the GADDS system.

Though Rexam challenges Dr. Reibenspies's data on several grounds, the Court finds Dr. Reibenspies's data and test results credible because (1) the decisions he made during his XRD experiments and data analysis were reasonable; and (2) the resulting deviations were insignificant and could not have substantially affected the test results.

First, Rexam argues that Dr. Reibenspies deviated from the '132 patent by using a graphite mirror instead of a Goebel mirror with a 0.3 mm slit. However, both Dr. Ortega and Dr. Reibenspies agreed that this substitution was an insubstantial change and would have had only a minor effect on the test results. Thus, Dr. Reibenspies's use of a graphite mirror instead of a Goebel mirror with a 0.3 mm slit did not have a considerable impact on Dr. Reibenspies's results.

Second, Rexam argues that Dr. Reibenspies set the GADDS detector too close to the tube sample, at 5 cm, resulting in skewed data. However, the XRD characterization parameters do not specify a sample-to-detector distance. Dr. Ortega, Rexam's expert, commented that a sample-to-detector distance can be set from 5 to 30 cm for the XRD experiment. Rexam Ex. 312 at 15. Thus, 5 cm is within a reasonable sample-to-detector distance range. Moreover, as discussed previously, the shorter the sample-to-detector distance, the more scattered radiation the detector detects, resulting in a higher photon count. Here, Dr. Reibenspies reasonably set the sample-to-detector distance at 5 cm. At that distance, the detector caught and revealed a substantial portion of the diffraction pattern, ensuring the data collected was statistically significant. Thus, using a 5 cm sample-to-detector distance in this case was not unreasonable.

Third, Rexam argues that Dr. Reibenspies did not oscillate the sample while collecting XRD data. Oscillation refers a physical movement of the sample stage during data collection. *See* Trial Tr. a.m., 74–75, Sept. 15, 2011. Since the sample did not move 0.5 mm during the data

collection, there was no oscillation. However, Dr. Ortega opined that the oscillation is not necessary to this experiment. Trial Tr. p.m., 91, Sept. 27, 2011. Therefore, not oscillating the sample had no major effect on the test result.

Moreover, Dr. Reibenspies collected two frames at each detector location from adjacent sections of the same tube sample and merged the data collected at the two positions to obtain an average reading of the two position settings before proceeding to analyze the data. This step did not significantly affect his results. Taking two frames of the same tube at adjacent sections of a tube under identical conditions should yield nearly identical data frames. Thus, the resulting merged frame, *i.e.*, the average of the two frames, should be substantially similar to the two original data frames. It follows that the XRD crystallinity derived from the merged frame should be substantially similar to the results derived from the original frames.

Fourth, Rexam contends that Dr. Reibenspies did not collect all five frames of data at the same sample-to-detection distance and failed to use all five frames of data in calculating the XRD crystallinity of each tube. However, his failure to collect all five frames of data at the same sample-to-detection distance had little impact on his test results because the last frame for each sample, taken at a different sample-to-detection distance from the other frames, was examined but not selected for subsequent analysis.

The XRD characterization parameters require that five frames of XRD data be collected but are silent as to how the data may be analyzed. Furthermore, the parameters do not specify the analytical software to be used in determining the XRD crystallinity of each sample. Thus, parties' experts must collect five frames of data at five specific detector locations, but they may reasonably select a software package to analyze the XRD data based on their professional training and experience. Since the XRD characterization parameters specify the use of Bruker

D8 Discover w/GADDS Detector, Dr. Reibenspies considered the software package that came with the instrument. After evaluating all three options available in the GADDS software package—Internal method, External method, and Full method—he decided to use the GADDS Full method to analyze the data. Dr. Reibenspies’s choice of the Full method is reasonable because (1) it is GADDS’s universal percent crystallinity calculation tool in that it will work with any system regardless of orientation or whether the crystalline peaks overlap the amorphous halo; and (2) it requires minimal user input, *i.e.*, it does not leave it to the user to estimate from the data generated where the crystalline peaks begin and end, so the results are consistent and reproducible.

Moreover, the GADDS Full method only analyzes one frame at a time. Upon examining all five frames, Dr. Reibenspies reported that the first frame contained sufficient information for calculating XRD crystallinity using the Full method, and the remaining frames did not include data beyond what was captured in the first frame. As such, all five frames were evaluated to determine the best frame to be used in the subsequent analysis, which ultimately determined the XRD crystallinity of the tube sample. Since only the first frame was used for the analysis, the last frame, measured with a sample-to-detector distance of 15 cm instead of 5 cm, played a very limited role in this process. In sum, the Court finds that Dr. Reibenspies’s method for analyzing the XRD data was reasonable. Additionally, his failure to collect the last frame at 5 cm did not affect the test results because the last frame’s contribution to the process of determining the XRD crystallinity of Rexam’s tubes was minimal.

Fifth, Rexam maintains that Dr. Reibenspies did not account for background noise or “Compton scattering” and therefore his results were inaccurate. However, while “Compton scattering can be modeled and removed in both the Internal and External methods,” the GADDS

user manual for the software does not mention that Compton scattering must be modeled and removed in the Full method. Instead, the GADDs user manual provides that Compton scattering is “unnecessary if the same material is examined and its density varies no more than ~20%.” MWV Ex. 911 at 8-2. Dr. Reibenspies opined that most fluoropolymers do not have density variations of more than about 20%. As such, Dr. Reibenspies is not required to address the issue of background noise or Compton scattering when using the Full method to determine the XRD crystallinity of Rexam’s tubes.¹⁰

For the reasons stated above, the Court finds that the XRD crystallinity of Rexam’s V1 tube is not greater than about 13%.¹¹ The Court further finds that the XRD crystallinity of Rexam’s V2 tube is not greater than about 13%. Consequently, the Court finds that fragrance pumps containing the V1 or V2 tube fall within the scope of claims 15 and 19 of the ’132 patent.

2. Valois’s Old Ultimate[®] Tube and New Ultimate[®] Tube

Valois has conceded that its Old tube is quenched; therefore, pumps containing the Old tube fall within the scope of MWV’s patents. *See MeadWestvaco*, 809 F. Supp. 2d at 471. The Court now finds that Valois’s New tube is quenched and thus Valois’s pumps containing the New tube fall within the scope of claims 15 and 19 of the ’132 patent.

The Court construed the term “quenched” to mean “rapidly cooled.” *MeadWestvaco*, 807 F.Supp.2d at 541. MWV retained Dr. Garth Wilkes, a professor of chemical engineering at the Virginia Polytechnic Institute and State University, as an expert in polymer science and engineering. Dr. Wilkes examined the temperature profile of the manufacturing process for the

¹⁰ Rexam also argues that the test done by Dr. Reibenspies is a relative crystallinity test that cannot be used for determining the absolute or true crystallinity of the dip tubes. However, the patents do not mention absolute crystallinity or relative crystallinity. The Court also notes that no references concerning absolute crystallinity or relative crystallinity from the technical manuals and Bob He’s textbook, which discussed the GADDs Full method, were presented to support this assertion. Therefore, this argument is not persuasive.

¹¹ The Court also notes that Dr. Ortega did not provide XRD test results for Rexam’s V1 tube.

New tube provided by Zeus, the tube supplier of Valois. He estimated that it takes [REDACTED] [REDACTED] for the tube to traverse the [REDACTED] while the temperature of the tube [REDACTED] MWV Ex. 1074 at 49. Dr. Wilkes opined that the New tube is rapidly cooled or quenched. The Court adopts Dr. Wilkes's conclusion because it is consistent with the contemporaneous literature at the time of the invention.

Dr. Wilkes testified that a [REDACTED] cooling rate is considered rapid cooling when compared to known cooling rates of processes considered to be quenching in the art. For instance, a 2005 report addressed to John Boyle, one of the inventors of the patents-in-suit, discussed a test conducted for determining the maximum crystallinity of an EFEP RP-4040 tube using differential scanning calorimetry by investigating its melting enthalpies after annealing and quenching. MWV Ex. 716. The report stated that quenching was achieved by cooling at a rate of 100 °C (212 °F) per minute. MWV Ex. 716. Dr. Wilkes also cited a 2004 article entitled "Cooling Studies on Polymer Crystallisation." MWV Ex. 1053. The article stated that "rapid cooling (a simulated quenching)" was achieved using liquid nitrogen in which a polyethylene terephthalate (PET) sample cooled from 300 °C (572 °F) to 30 °C (86 °F) in 5 minutes, at a cooling rate of 97 °F per minute. MWV Ex. 1053 at 1. These documents indicate that polymer material may be considered to be rapidly cooled or quenched at a rate as low as 97 °F per minute. Therefore, the New tube, which [REDACTED] is rapidly cooled or quenched.

The Court dismisses the testimony of Dr. Alan Jeffery Giacomini, Valois's expert, because his opinion that the New tube is not rapidly cooled is not supported by actual evidence. Dr. Giacomini is a professor of mechanical engineering at the University of Wisconsin. He

suggested that to determine whether the New tube is quenched, the relevant measure of the temperature is the temperature inside of the tube. Dr. Giacomini opined that the New tube is not quenched in the tank and, after the tube exits the cooling tank, the material on the inside of the tube stays molten and then flows downward under its own weight. According to him, this is why unquenched tubing rarely retains its extruded cross section and it is usually thicker on the bottom than on the top of the tube. Nonetheless, Dr. Giacomini did not perform any specific analysis concerning what exactly happened inside Valois's invisible tubes. Trial Tr. a.m., 87, Sept. 21, 2011. Instead, he opined that the temperature of the inside of the tube cannot be measured. However, he stated that it is possible to use the conservation of energy to calculate the temperature inside of the tube. He provided equations for performing the calculations, but he testified that he did not actually carry out the calculations because the thermal diffusivity and thermal conductivity of the EFEP are not available. Trial Tr. a.m., 82–83, Sept. 21, 2011. As such, Dr. Giacomini's theory concerning whether the New tube is rapidly cooled or quenched remains unsupported by either real measurements or theoretical calculations.

Valois also argues that the New tube is not rapidly cooled or quenched because the cooling rate of the New tube [REDACTED] is nearly [REDACTED] slower than that of a quenched tube described in the patent specification, estimated to be 530,000 °F per minute. The Court rejects this argument. The Court notes that its construction of the term "quenched" was "rapidly cooled," which does not restrict the actual cooling rate or cooling medium. While a dip tube is certainly rapidly cooled at a rate of 530,000 °F per minute, this determination bears no weight on the issue of whether a dip tube can also be considered rapidly cooled at a cooling rate of [REDACTED]. Based on all the evidence presented, the Court finds that Valois's New

tube is rapidly cooled or quenched; consequently, Valois's pumps containing the New tube fall within the scope of claims 15 and 19 of the '132 patent.

3. Fragrance Products Manufactured by Fragrance Houses

Fragrance products containing pumps with Defendants' invisible dip tubes, the V1 and V2 tubes as well as the Old and New tubes, fall within the scope of claim 9 of the '132 patent and claims 1 and 20 of the '819 patent. Claim 9 of the '132 patent and claims 1 and 20 of the '819 patent concern fragrance products containing pumps with an invisible dip tube. Defendants sell their pumps to fragrance houses, which incorporate the pumps into their fragrance products. This patent litigation focuses on whether the XRD crystallinity of Rexam's invisible tubes exceeds 13% and whether Valois's New tube is quenched. The Court has found that Rexam's V1 and V2 tubes and Valois's Old and New tubes literally infringe claims 15 and 19 of the '132 patent. It follows that when Defendants' clients incorporate these infringing pumps into their fragrance products, the resulting products fall within the scope of claim 9 of the '132 patent and claims 1 and 20 of the '819 patent.

B. Liability for Direct Infringement

The Court concludes that Rexam America directly infringed claims 15 and 19 of the '132 patent because it sold infringing pumps containing the V2 tube in the United States after the patent was issued. However, the Court concludes that Rexam France is not liable for direct infringement because its relevant activities with respect to either the V1 or V2 tube occurred outside of the United States.

The Court concludes that Valois America directly infringed claims 15 and 19 of the '132 patent because the evidence indicates that Valois sold pumps containing the Old or New tube in the United States. The Court concludes that Valois France cannot be held liable for direct

infringement because (1) it only imports invisible dip tubes, not pumps, in the United States; and (2) all the relevant activities with respect to the sale of pumps containing the Old or New tube took place abroad.

“[W]hoever without authority makes, uses, offers to sell, or sells any patented invention, within the United States, or imports into the United States any patented invention during the term of the patent therefor, infringes the patent.” 35 U.S.C. 271(a). “To prove direct infringement, the plaintiff must establish by a preponderance of the evidence that one or more claims of the patent read on the accused device literally.” *Cross Med. Prods.*, 424 F.3d at 1310. It is well-established that the reach of § 271(a) is limited to infringing activities that occur within the United States. *See Rotec Indus. v. Mitsubishi Corp.*, 215 F.3d 1246, 1251 (Fed. Cir. 2000) (“These extraterritorial activities however, are irrelevant to the case before us, because ‘[t]he right conferred by a patent under our law is confined to the United States and its territories, and infringement of this right cannot be predicated of acts wholly done in a foreign country’”). A party cannot be liable for infringement under § 271 when all of the relevant activities took place outside of the United States. *Shockley v. Arcan, Inc.*, 248 F.3d 1349, 1364 (Fed. Cir. 2001).

The Court has found that pumps containing Defendants’ invisible tubes, Rexam’s V1 and V2 tubes as well as Valois’s Old and New tubes, literally infringe claims 15 and 19 of the ’132 patent. The Court next addresses the issue of direct infringement.

Here, Rexam America stopped selling pumps containing the V1 tube and began selling those containing the V2 tube around March 18, 2010. Trial Tr. p.m., 11, Sept. 26, 2011. Since the ’132 patent was issued, Rexam America sold millions of pumps containing the V2 tube within the United States. Therefore, the Court concludes that Rexam America directly infringed claims 15 and 19 of the ’132 patent.

Due to the nature of Rexam's worldwide distribution system, Rexam France only sells pumps to clients outside the United States. This practice has not changed since the '132 patent was issued. Absent any evidence to the contrary, the Court concludes that Rexam France cannot be held liable for directly infringing claims 15 and 19 of the '132 patent because the relevant activities took place outside this country.

Valois America sold its pumps containing the Old tube to one client on two occasions after the '132 patent was issued. VOA 267. Valois America also sold fragrance pumps containing the New tube after the '132 patent was issued. VOA 267. Consequently, the Court concludes that Valois America directly infringed claims 15 and 19 of the '132 patent.

Valois France supplied invisible dip tubes to Valois America, but it only sold pumps to clients outside the United States. This practice has not changed since the '132 patent was issued. Additionally, claims 15 and 19 of the '132 patent concern pumps with an invisible dip tube. As such, importing invisible dip tubes into the United States alone does not render Valois France liable for direct infringement of claims 15 and 19 of the '132 patent. Moreover, because the relevant activities with respect to the sale of pumps containing the Old and New tubes took place outside the United States, Valois France cannot be held liable for direct infringement of claims 15 and 19 of the '132 patent.

C. Liability for Indirect Infringement

1. Contributory Infringement

The Court concludes that neither Rexam nor Valois is liable for contributory infringement of claim 9 of the '132 patent and claims 1 and 20 of the '819 patent. Specifically, the Court concludes that Rexam is not liable for contributory infringement of the patents for selling pumps containing the V2 tube, because MWV fails to show, by a preponderance of the

evidence, that Rexam had the requisite knowledge that its clients' fragrance products, containing Rexam's pumps with the V2 tube, infringed the patents. Additionally, though Rexam France sold pumps containing the V1 and V2 tubes outside the United States after the patents were issued, it is not liable for contributory infringement because all relevant activities took place outside this country.

The Court concludes that Valois is not liable for contributory infringement of the patents for selling pumps containing the New tube because MWV fails to show, by a preponderance of the evidence, that Valois had the requisite knowledge that its clients' fragrance products, containing Valois's pumps with the New tube, infringed the patents. Additionally, the Court concludes that Valois America is not liable for contributory infringement of the patents for selling pumps containing the Old tube to one client after the patents were issued because MWV fails to establish direct infringement of the patents as the business operation of this client is unknown. Lastly, though Valois France also sold pumps with the Old and New tubes outside the United States after the patents were issued, it is not liable for contributory infringement because all relevant activities took place outside this country.

MWV alleges that Rexam and Valois are liable for contributory infringement of claim 9 of the '132 patent and claims 1 and 20 of the '819 patent. These patent claims concern a fragrance product whose components are a container containing liquid fragrance and a pump with a dip tube. *See* '132 Patent col.7 ll.52–60, col.8 ll.1–3; '819 Patent col.7 ll.41–55, col.8 ll.47–48. The dip tube is extruded and quenched, and the XRD crystallinity of the tube is not greater than about 13%. *Id.*

Contributory infringement liability arises when one:

offers to sell or sells within the United States or imports into the United States a component of a patented machine, manufacture, combination or composition, or a material or apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be especially made or especially adapted for use in an infringement of such patent, and not a staple article or commodity of commerce suitable for substantially noninfringing use

35 U.S.C. § 271(c) (2006). “Contributory infringement imposes liability on one who embodies in a non-staple device the heart of a patented process and supplies the device to others to complete the process and appropriate the benefit of the patented invention.” *Vita-Mix Corp. v. Basic Holding, Inc.*, 581 F.3d 1317, 1327 (Fed. Cir. 2009) (citing *Ricoh Co. v. Quanta Computer, Inc.*, 550 F.3d 1325, 1337 (Fed. Cir. 2008)). To hold a component supplier liable for contributory infringement, a patentee must prove four elements:

- (a) the supplier’s product was used to commit acts of direct infringement;
- (b) the product’s use constituted “a material part of the invention”;
- (c) the supplier knew its product was “especially made or especially adapted for use in an infringement” of the patent; and
- (d) the product is “not a staple article or commodity of commerce suitable for substantial noninfringing use.”

Arris Grp, Inc. v. British Telecomms. PLC, 639 F.3d 1368, 1375 (Fed. Cir. 2011) (internal citations omitted).

With respect to the third element, the Supreme Court has interpreted the provision to require the accused infringer to know of the existence of the patent and that the use of the component in the combination would be infringing. *See Aro Mfg. Co. v. Convertible Top Replacement Co.*, 377 U.S. 476, 491 (1964) (opining that the alleged contributory infringer

“cannot be held liable in the absence of a showing that, at that time, it had already acquired the requisite knowledge” that the combination to which the alleged contributory infringer’s product is a component “were patented and infringing”). Contributory infringer’s knowledge about the combination for which its components were especially made was both patented and infringing can be established through circumstantial evidence. *i4i Ltd. P’ship v. Microsoft Corp.* 598 F.3d 831, 851 (Fed. Cir. 2010) (stating that jury could have reasonably concluded that accused contributory infringer knew about the patent and knew use of its product would infringe because evidence showed that some employees of the infringer either heard about the patent or were “familiar” with patent owner’s products and believed the infringing product would render patent owner’s products “obsolete”).

MWV has established elements (b) and (d), as well as the first part of (c) with respect to all Defendants. First, Defendants’ pumps with their invisible tubes are a material part of the invention. The record shows that the objective of the inventors was to conceal the dip tube used in fragrance bottles so that the fragrance products were aesthetically pleasing. They did this by extruding and quenching fluoropolymer tubing whose refractive index is comparable to that of the fragrance liquid. Therefore, the invisible dip tube is the focus of the asserted patents.

Second, Defendants knew of the existence of the MWV’s patents. Rexam and Valois were informed about its MWV’s patent applications regarding the NoC[®] technology after the applications were published. Moreover, before the patents were issued, each Defendant studied the claims of these upcoming patents and redesigned its invisible dip tube in the effort to avoid infringement of the patents. Third, the dip tubes are not a staple article or commodity of commerce suitable for substantial non-infringing use. Representatives from Rexam and Valois

testified that the dip tubes are to be attached to pumps that were sold to fragrance houses. *See e.g.*, Trial Tr. p.m., 46–47, Sept. 9, 2011.

Additionally, with respect to the first element, as discussed above, fragrance products manufactured by Defendants' clients containing Defendants' infringing pumps fall within the scope of claim 9 of the '132 patent and claims 1 and 20 of the '819 patent. Direct infringement of the patents can be established upon the showing of an act specified in 35 U.S.C §271(a), such as the importation of the infringing fragrance products into the United States.

Thus, to hold Defendants liable for contributory infringement, MWV must prove, by a preponderance of the evidence, that the second part of the third element is satisfied, *i.e.*, Defendants had the requisite knowledge that the use of the pumps containing their invisible dip tubes in clients' fragrance products would be infringing. Essentially, MWV must show that Defendants had knowledge that the invisible dip tube in their pumps was extruded and quenched and the XRD crystallinity of the dip tube was not greater than about 13%.

a. Rexam

Rexam is not liable for contributory infringement because there is insufficient evidence to show that Rexam had knowledge that the XRD crystallinity of the V2 tube was not greater than about 13%. The following are events that are relevant to Rexam's knowledge with respect to the crystalline content of the V2 tube. In late 2009, Rexam started its development of the V2 tube with its tube supplier, Markel. In an internal email dated December 3, 2009, Dr. Charles P. Marino, a Corporate Research Fellow at Markel, expressed his concerns regarding Rexam-Markel's design-around efforts, which focused on percent crystallinity of the dip tube:

It would seem efforts to circumvent any eventual patent by focusing narrowly on percent crystallinity are insufficient, as the other boundary conditions laid out would also be operative. One needs an index of infraction match to the fragrance, low

crystallinity to impart the optical clarity required and the fluoropolymer structure to impart sufficient chemical resistance any mixtures of grades of EFEP with varying molecular weight do not seem to offer an effective approach to achieving the performance desired outside of the boundary condition restraints.

MWV Ex. 1037. This email was forwarded to Tareq Ahmad, the project manager at Rexam. In an email dated Tuesday, December 15, 2009, Mr. Ahmad forwarded Dr. Marino's email to Mr. Raby, the Vice President of Global Product Development at Rexam. In that email, Mr. Ahmad wrote:

Markel would like to be seen as a contributing partner to this research endeavor and hence they are providing their perspective. Dr. Marino's questions mostly revolve around patent circumvention as it relates to the technical focus. Some of his information is inaccurate, however this is his current viewpoint.

They would like to discuss further on Thursday, prior to proceeding with the trial.

MWV Ex. 1037.

In January 2010, Markel experimented with extruding tubes from different blends of EFEP RP-4020 and EFEP RP-5000 and the blend of 70% EFEP RP-4020 plus 30% EFEP RP-5000 was selected for manufacturing the V2 tube. Additionally, on February 3, 2010, Rexam filed a U.S. Provisional Patent Application 61/301,108 which disclosed a dip tube that is "substantially transparent with alcohol-based liquids such as fragrance." MWV Ex. 1041 RXB 161003. It mentioned that the crystallinity of the dip tube "may be about 18% or more, 25% or more, or about 30% or more." MWV Ex. 1041 at RXB161008. After the litigation started, Rexam retained an expert, Dr. Ortega, to conduct XRD tests and determined the XRD

crystallinity of the V2 tube for the purposes of litigation. Dr. Ortega concluded that the XRD crystallinity of Rexam's V2 tube is above 13%.¹²

No evidence indicates that Rexam had the requisite knowledge that the XRD crystallinity of the V2 tube was not greater than 13%. At the early stage of the process, evidence shows that one employee at Markel, Dr. Marino, expressed doubt about the approach of blending different grades of EFEP. However, Dr. Marino did not provide any details for his concerns. Nor did he present any data to support his view. Moreover, Rexam's employees did not seem concerned about Dr. Marino's view and continued testing on various blends of EFEP resins in January 2010.

Furthermore, Rexam's provisional patent application discloses a transparent dip tube that was made from a blend of fluoropolymers and has an XRD crystallinity higher than 15%. The Court credits this evidence as indicia that Rexam did not have reason to believe that the XRD crystallinity of the V2 tube was not greater than about 13% because nothing indicates that Rexam or its counsel would knowingly make misrepresentations to the USPTO. Additionally, Dr. Ortega tested a few V2 tubes and determined that the XRD crystallinity of the V2 tube was higher than 13%. He also submitted an expert report to explain his findings and rebut Dr. Reibenspies's conclusions with respect to the V2 tube. In sum, the record contains no convincing evidence suggesting that Rexam had the knowledge that the XRD crystallinity of the V2 tube in its pumps was not greater than 13%. Therefore, Rexam is not liable for contributory infringement of claim 9 of the '132 patent and claims 1 and 20 of the '819 patent.

¹² During the development of the V2 tube, Rexam conducted tests for dip tube retention and stiffness to determine the differences between V1 and V2 tubes. It also appears to the Court that there were tests conducted concerning crystallinity of Rexam's tubes during the development process of the V2 tube. Rexam claims that all of the testing conducted was performed through its legal counsel, and the test results are not produced because of the attorney-client privilege.

Additionally, though Rexam France sold pumps containing V1 and V2 tubes after the patents were granted, it is not liable for contributory infringement because all relevant activities took place outside this country. Rexam France only sells pumps outside the United States; therefore, it cannot be held liable under §271(c), which imposes liability on the accused infringer for offering to sell or selling within the United States or importing into the United States a component, *i.e.*, pumps, of a patented item, *i.e.*, fragrance products. *See* 35 U.S.C. §271(c).

b. Valois

The Court concludes that Valois is not liable for contributory infringement of claim 9 of the '132 patent and claims 1 and 20 of the '819 patent for selling pumps containing the New tube because MWV fails to establish, by a preponderance of the evidence, that Valois had knowledge that the New tube was quenched. The record shows that Valois depended on Zeus's expertise in extruding fluoropolymer tubes to design around the patent. Zeus recommended to Valois that extruding the tube without quenching it would avoid infringement of MWV's forthcoming patents. Even though Zeus was reluctant to reveal its production information to its clients, Valois obtained temperature data for the new manufacturing process. The data showed that when the New tube exited the cooling tank, its temperature was higher than that of the Old tube in the old manufacturing process. Additionally, the physical properties of the New tube, such as softness, flexibility, and haziness, differed from that of the Old tube. Moreover, the line speed during production was slower, which caused an increase in price of the New tube.

After this lawsuit was commenced, Valois sought additional information from Zeus, who certified that the new extrusion process is "unquenched." Moreover, Valois retained Dr. Giacomini, an expert on quench tanks, who opined that the New tube is not quenched. Dr. Giacomini also submitted a report explaining his opinion. The record shows that Valois received

information from its tube supplier and expert that suggested the manufacturing process employed to produce the New tube did not involve quenching. Therefore, Valois is not liable for contributory infringement for selling pumps containing the New tube.

Additionally, the Court concludes that Valois America is not liable for contributory infringement of the patents for selling pumps containing the Old tube to one client after the patents were issued because MWV cannot establish direct infringement as the details concerning the business operation of this client is not available. After the patents were granted, Valois America sold Chantecaille Beauté pumps containing the Old tube on two occasions. Valois Ex. 267. However, little information is known about the business operation of this company. For instance, it is not clear whether Chantecaille Beauté has attached these infringing pumps to its fragrance bottles. As such, MWV fails to show direct infringement of claim 9 of the '132 patent and claims 1 and 20 of the '819 patent. Consequently, Valois America is not liable for contributory infringement of the patents.

Lastly, though Valois France also sold pumps with Old and New tubes outside the United States after the patents were issued, it is not liable for contributory infringement because all relevant activities took place outside this country. Valois France only sells pumps outside the United States;¹³ therefore, it cannot be held liable under §271(c), which imposes liability on the accused infringer for offering to sell or selling within the United States or importing into the United States a component, *i.e.*, pumps, of a patented item, *i.e.*, fragrance products. *See* 35 U.S.C. §271(c).

¹³ Valois France also supplies Valois America with invisible dip tubes, *i.e.*, Valois France imports invisible dip tubes into the United States. Because there is no evidence as to whether Valois France shipped any Old tubes to Valois America after the patents were issued, Valois France cannot be found liable for contributory infringement. Moreover, because Valois America sold pumps with the New tube after the patents were issued, it is reasonable to infer that Valois France shipped New tubes to Valois America after the patents were issued. However, Valois France cannot be found liable for contributory infringement because, as discussed earlier, Valois France lacks the requisite knowledge that the New tube was quenched.

2. Induced Infringement

The Court concludes that neither Rexam nor Valois is liable for inducing infringement of claim 9 of the '132 patent and claims 1 and 20 of the '819 patent. Specifically, the Court concludes that Rexam is not liable for inducing infringement for selling pumps containing the V2 tube because MWV fails to show, by a preponderance of the evidence, that Rexam had the requisite knowledge that its clients' fragrance products, containing Rexam's pumps with the V2 tube, infringed the patents. Additionally, though Rexam France sold pumps containing the V1 tube outside the United States after the patents were issued, the Court concludes that it is not liable for inducing infringement because MWV fails to show, by a preponderance of the evidence, that Rexam France possessed specific intent to cause direct infringement of the patents.

The Court concludes that Valois is not liable for inducing infringement for selling pumps containing the New tube because MWV fails to show, by a preponderance of the evidence, that Valois had the requisite knowledge that its clients' fragrance products, containing Valois's pumps with the New tube infringed the patents. Additionally, the Court concludes Valois America is not liable for inducing infringement for selling pumps containing the Old tube after the patents were issued because MWV fails to establish that Valois America possessed the specific intent to encourage direct infringement of the patents as the circumstances under which the sale took place are unclear. Lastly, the Court concludes Valois France is not liable for inducing infringement for selling pumps containing the Old tube outside the United States after the patents were issued because MWV fails to establish direct infringement of the patents.

Section § 271(b) provides: “Whoever actively induces infringement of a patent shall be liable as an infringer.” 35 U.S.C. § 271(b). In order to establish a claim for inducing infringement, “the patentee must show, first that there has been direct infringement, and second, that the alleged infringer knowingly induced infringement and possessed specific intent to encourage another’s infringement.” *MEMC Electronic Materials, Inc. v. Mitsubishi Materials Silicon Corp.*, 420 F.3d 1369, 1378 (Fed. Cir. 2005). The second showing, defendant’s knowing inducement of the direct infringement, requires the establishment of two elements; namely, some affirmative act by defendant that induced the direct infringement, and that defendant acted with the requisite state of mind. *See Manville Sales Corp. v. Paramount Sys., Inc.*, 917 F.2d 544, 553–54 (Fed. Cir. 1990). “The intent requirement for inducement requires more than just intent to cause the acts that produce direct infringement. Beyond that threshold knowledge, the inducer must have an affirmative intent to cause the direct infringement.” *DSU Med. Corp. v. JMS Co.*, 471 F.3d 1293, 1306 (Fed. Cir. 2006).

Additionally, induced infringement under § 271(b) requires actual knowledge that the induced acts constitute patent infringement; and this is the same knowledge requirement for contributory infringement analysis under § 271(c). *See Global-Tech Appliances, Inc. v. SEB S.A.*, 131 S.Ct. 2060, 2068 (2011). The accused infringer’s knowledge may be found under the doctrine of willful blindness. *Id.* The two basic requirements of willful blindness are: “(1) the defendant must subjectively believe that there is a high probability that a fact exists[;] and (2) the defendant must take deliberate actions to avoid learning of that fact.” *Id.* at 2070.

a. Rexam

The Court concludes that Rexam is not liable for inducing infringement of claim 9 of the '132 patent and claims 1 and 20 of the '819 patent. First, the Court concludes that Rexam is not liable for inducing infringement for selling pumps containing the V2 tube because MWV fails to show, by a preponderance of the evidence, that Rexam had the requisite knowledge that its clients' fragrance products, containing Rexam's pumps with the V2 tube, infringed the patents. As discussed above, the Court has found that MWV fails to establish that Rexam knew that the XRD crystallinity of the V2 tube is not greater than 13%. Furthermore, the Court does not find convincing evidence that Rexam subjectively believed that there was a high probability that the XRD crystallinity of the V2 tube is not greater than 13%; nor is there evidence showing that Rexam took deliberate actions to avoid learning of that fact. As such, MWV fails to show that Rexam had the requisite knowledge that its clients' fragrance products, which contain its pumps with the V2 tube, infringed the patents. Consequently, Rexam is not liable for inducing infringement for selling pumps containing the V2 tube.

Additionally, though Rexam France sold pumps containing the V1 tube outside the United States after the patents were issued, the Court concludes that it is not liable for inducing infringement because MWV fails to show, by a preponderance of the evidence, that Rexam France possessed the specific intent to encourage direct infringement of the patents. After the patents were issued, Mr. Raby, Rexam's Vice President of Global Product Development, instructed Rexam's employees to inform their customers that if they chose to receive the pumps containing the V1 tube after the patents were issued, they should only distribute their fragrance products containing these pumps outside the United States. Rexam France knew that its pumps containing the V1 tube fell within the scope of the '132 patent. It also knew that its clients

would directly infringe the patents if they imported into the United States their fragrance products containing pumps with the V1 tube. *See* 35 U.S.C. § 271(a). However, Mr. Raby specifically advised against any importation of the infringing products, indicating that Rexam France wanted its clients to avoid direct infringement of the patents. Accordingly, Mr. Raby's instructions weighs against a finding that Rexam France actively encouraged its clients to infringe the patents.

b. Valois

The Court concludes that Valois is not liable for inducing infringement of claim 9 of the '132 patent and claims 1 and 20 of the '819 patent. Specifically, the Court concludes that Valois is not liable for inducing infringement for selling pumps containing the New tube because MWV fails to show, by a preponderance of the evidence, that Valois had the requisite knowledge that its clients' fragrance products, containing Valois's pumps with the New tube infringed the patents. As discussed above, the Court finds that MWV fails to establish that Valois knew that the New tube is quenched. Furthermore, the Court does not find convincing evidence that Valois subjectively believed that there was a high probability that the New tube is quenched; nor is there evidence showing that Valois took deliberate actions to avoid learning of that fact. Thus, MWV fails to show that Valois had the requisite knowledge that its clients' fragrance products, which contain its pumps with the New tube, infringed the patents. Consequently, Valois is not liable for inducing infringement for selling pumps containing the New tube.

Additionally, the Court concludes Valois America is not liable for inducing infringement for selling pumps containing the Old tube in the United States after the patents were issued because MWV fails to establish that Valois America possessed the specific intent to encourage direct infringement of the patents as the circumstances under which the sale took place are

unclear. Valois America sold pumps containing the Old tube to Chantecaille Beauté on two occasions. MWV offered little additional evidence as to the circumstances under which the sale took place. Thus, the Court finds no evidence indicating Valois America actively encouraged direct infringement of the patents.

Lastly, the Court concludes Valois France is not liable for inducing infringement for selling pumps containing the Old tube outside the United States after the patents were issued because MWV fails to establish direct infringement. MWV cannot establish that any fragrance products containing these pumps were imported into the United States. Valois France sold pumps containing the Old tube outside the United States after the patents were issued, and many of these pumps were sold to European clients who do not import their fragrance products into the United States. Nonetheless, it is possible that some pumps were sold to clients who may import their fragrance products containing these pumps into the United States. However, MWV fails to present evidence establishing that such importation in fact took place. Moreover, because after the patents were issued, Valois France sold only a minimal amount of pumps with the Old tube to clients who may import their fragrance products into the United States, as compared to the amount of pumps sold with the New tube, the Court cannot reasonably infer that some fragrance products containing pumps with the Old tube were imported into the United States. Therefore, the Court concludes Valois France is not liable for inducing infringement for selling pumps containing the Old tube outside the United States.

D. Willful Infringement

The Court finds that MWV fails to demonstrate by clear and convincing evidence that Defendants¹⁴ willfully infringed its patents because each Defendant has a reasonable defense to the charge of infringement. Willfulness is a question of fact. *Spine Solutions, Inc. v. Medtronic Sofamor Danek USA, Inc.*, 620 F.3d 1305, 1319 (Fed. Cir. 2010). The Federal Circuit has set the legal standard for willful infringement:

[T]o establish willful infringement, a patentee must show by clear and convincing evidence that the infringer acted despite an objectively high likelihood that its actions constituted infringement of a valid patent. The state of mind of the accused infringer is not relevant to this objective inquiry. If this threshold objective standard is satisfied, the patentee must also demonstrate that this objectively-defined risk (determined by the record developed in the infringement proceeding) was either known or so obvious that it should have been known to the accused infringer.

In re Seagate Techn., LLC, 497 F.3d 1360, 1371 (Fed. Cir. 2007) (citation omitted). The “objective” prong of *Seagate* tends not to be met where an accused infringer relies on a reasonable defense to a charge of infringement,” even when the defense is not ultimately successful. *Spine Solutions, Inc.*, 620 F.3d at 1319.

Here, Defendants raised legitimate, albeit ultimately unsuccessful, defenses of non-infringement that were not completely resolved in pretrial motions, and the issues concerning these defenses proceeded to trial. These defenses are based on Defendants’ design-around efforts before the patents were issued. Specifically, Rexam America contends that pumps containing the V2 tube do not fall within the scope of the ’132 patent because the XRD

¹⁴ Unless otherwise noted, the term “Defendants” refers to Rexam America and Valois America. Rexam France and Valois France are not subject to the willfulness analysis because the Court concludes that they are not liable for direct infringement or indirect infringement. To the extent that Valois America sold its old Ultimate dip tube after the patents were issued, the Court declines to address whether Valois America willfully infringed the patents because the circumstances under which the sale was made are unknown.

crystallinity of the V2 tube is higher than 13%. Its expert, Dr. Ortega, testified that he conducted XRD tests on a few V2 tubes and analyzed the data. He asserted that the XRD crystallinity of the V2 tube is above 13%. Though the Court finds that pumps containing the V2 tube fall within the scope of the '132 patents, the Court does not find Rexam's defense with regard to the XRD crystallinity is without merit.

Similarly, Valois America maintains that the New tube is extruded without being subject to a quenching process. Jeff Hawley, Vice President of Operations at Zeus, opined that he believed that the New tube [REDACTED] He testified that the process [REDACTED]

[REDACTED] Trial Tr. a.m., 54-55, Sept. 20, 2011. While the Court finds that the New tube is quenched, Valois America's non-infringement defense is not frivolous. In sum, because each Defendant was able to formulate a reasonable non-infringement defense and produced evidence and testimony to support that defense, MWV has not satisfied the "objective" prong of the *Seagate* test.

Even if MWV had established the "objective" prong of *Seagate*, it could not meet the second prong of *Seagate* because it fails to demonstrate by clear and convincing evidence that each Defendant knew or should have known that its actions constituted a high risk of infringement of a valid and enforceable patent. As discussed above, before the USPTO issued the patents, each Defendant investigated several design-around options to avoid infringement of the upcoming patents. The information each Defendant received during the design-around process precludes the finding that it knew or should have known that there is a high likelihood that its redesigned tube would infringe MWV's new patents.

MWV also argues that the fact that Defendants copied or reverse engineered the NoC[®] tube to make their own version of the invisible dip tube illustrates willful infringement. This argument is misplaced. “Evidence of copying in a case of direct infringement is relevant only to *Seagate’s* second prong, as it may show what the accused infringer knew or should have known about the likelihood of its infringement.” *DePuy Spine, Inc., v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1336 (Fed. Cir. 2009). However, in this case, the alleged copying and reverse engineering by Defendants took place years before the asserted patents were issued and before the lawsuit was filed. Additionally, prior to the issuance of the asserted patents, each Defendant worked with its tube supplier to design around the patents and made a new version of its respective invisible tube. After the patents were issued, each Defendant transitioned to sell its new version of invisible dip tube to avoid infringement of MWV’s patents. Defendants’ design around efforts undermines MWV’s claims of willful infringement.

In sum, MWV fails to establish by clear and convincing evidence that (1) Defendants acted despite an objectively high likelihood that their actions constituted infringement of a valid patent; and (2) Defendants knew or should have known this objectively-defined risk. Consequently, the Court finds the infringement is not willful.

E. Attorney Fees

The Court declines to award attorney fees to MWV because it fails to prove by clear and convincing evidence that this case is exceptional as the Court is not persuaded that Defendants’ litigation tactics amount to bad faith conduct. A district court is vested with the authority to award attorney fees to a prevailing party in patent litigation under 35 U.S.C. § 285. The purpose of § 285 when applied to accused infringers is generally said to be two-fold: (1) it discourages infringement by penalizing the infringer; and (2) it prevents “gross injustice” when the accused

infringer has litigated in bad faith. *Beckman Instruments, Inc. v. LKB Produkter AB*, 892 F.2d 1547, 1552 (Fed. Cir. 1989). In interpreting § 285, courts must be mindful of the limited circumstances in which an award of attorney fees is appropriate so that the recovery of attorney's fees does not become an ordinary thing in patent suits. *Forest Labs., Inc. v. Abbott Labs.*, 339 F.3d 1324, 1329 (Fed. Cir. 2003) (internal citation omitted).

To be awarded attorney fees, the prevailing party must establish, by clear and convincing evidence, that the case is exceptional. 35 U.S.C. § 285; *Forest Labs.*, 339 F.3d at 1327. "The prevailing party may prove the existence of an exceptional case by showing: inequitable conduct before the PTO; litigation misconduct; vexatious, unjustified, and otherwise bad faith litigation; a frivolous suit or willful infringement." *Epcon Gas Sys., Inc. v. Bauer Compressors, Inc.*, 279 F.3d 1022, 1034 (Fed. Cir. 2002). When examining litigation conduct, courts need to be "mindful that hard-fought, zealous advocacy does not necessarily amount to vexatious or bad faith litigation" See *Powell v. Home Depot U.S.A., Inc.*, 715 F. Supp. 2d 1285, 1297 (S.D. Fla. 2010) (citation omitted).

MWV argues that this case is exceptional because (1) Defendants willfully infringed its patents and (2) each Defendant separately engaged in vexatious and unjustifiable litigation strategies. The Court holds that MWV fails to prove by clear and convincing evidence that Defendants willfully infringed the asserted patents. Additionally, the Court holds that Defendants' alleged litigation misconduct does not warrant the award of attorney fees. MWV's arguments against each Defendant will be discussed in turn.

1. Rexam

MWV argues that this case is exceptional with respect to Rexam because (1) Rexam tried to patent the same invention it claimed not to infringe, (2) Rexam concealed from MWV the fact that Rexam tried to patent the same invention, (3) some of Rexam's positions in this litigation were inconsistent with its conduct in filing patents and the claims of these patents, and (4) Rexam refused to stipulate that the crystallinity was the only element in dispute on the issue of infringement. The Court rejects each of these arguments.

First, MWV argues that Rexam obtained two French patents and filed two U.S. patent applications directed to the same invention of the asserted patents. However, this Court lacks relevant information to assess the merit of the French patents, as little information or testimony pertaining to the French patents was proffered in this case. Similarly, the Court declines to evaluate Rexam's U.S. patent applications because (1) the USPTO is the proper authority to evaluate the merit of a U.S. patent application, and (2) there was very limited information proffered by the parties relating to the substance of these applications. Therefore, mere allegations that Rexam obtained foreign patents and the fact that it filed two U.S. patent applications concerning an invisible dip tube cannot prove that the case is exceptional.

Second, MWV argues that Rexam attempted to conceal from MWV the fact that Rexam tried to patent the same invention. On April 1, 2011, the magistrate judge ordered Valois to amend its privilege log. MWV informed Rexam that Rexam's privilege log had similar deficiencies in view of the magistrate judge's order. Rexam amended its privilege log so that some documents previously labeled, "Patent Matters" became "Patent Prosecution" or "Rexam Patent Application." These changes revealed that Rexam had not produced documents related to its efforts to patent an invisible dip tube. However, MWV has not provided evidence indicating

any egregious litigation misconduct that warrants a finding of an exceptional case here. Rather, Rexam complied with the magistrate judge's order and responded to MWV's request to change its privilege log. As a result, MWV was able to obtain documents concerning Rexam's patents and patent applications. Therefore, Rexam's compliance with the court order and response to MWV's request to change its privilege log undermine the argument that Rexam's alleged misconduct is egregious.

Third, MWV argues that Rexam seeking patents directed to an invisible dip tube in the United States and France indicates some of its defenses, such as invalidity, were not raised in good faith. The Court disagrees. The Court is aware of no legal authority that requires the accused infringer's patent portfolio management be consistent with its litigation strategy, even when the two components are managed by counsel from the same law firm. The Court also notes that these patents and the applications were filed years or at least months before the commencement of this lawsuit. At the time of filing of these patents, Rexam could not possibly anticipate all potential lawsuits it must defend or formulate all possible defenses it might raise in future litigations. Thus, Rexam cannot be precluded from raising certain defenses in future litigations simply because these defenses may be inconsistent with the claims in its patent applications. Moreover, as discussed above, the Court does not have the necessary information to evaluate the merits of these patents and applications. Although the fact that Rexam sought to obtain patents for an invisible tube may undercut some of its defenses raised in the litigation, there is no evidence indicating Rexam raised any of its defenses in bad faith.

Fourth, MWV argues that this is an exceptional case because Rexam refused to stipulate that crystallinity was the only element in dispute on the infringement claim. However, our common law system rests on an adversarial framework; a party need not agree or stipulate issues

related to its defense with its opponent. Absent a clear legal authority, whether Rexam should have refused MWV's proposed stipulation is at its sole discretion, and this Court declines to comment on litigation strategies of Rexam's counsel. The Court concludes that MWV fails to meet its burden of proof to show that its case against Rexam is exceptional; therefore, an award of attorney fees is not warranted.

2. Valois

MWV's argues that its case against Valois is exceptional because (1) certain courses Valois took during the litigation resulted in wasted MWV resources and unnecessary delay; (2) Valois failed to stipulate to the issue of quenching and denied MWV's requests for admission relating to the crystallinity issue; (3) Valois obstructed discovery from its supplier Zeus; and (4) Valois attempted to conceal the fact that the Old tube was ordered and pumps containing the Old tube were sold after the patents were issued by presenting misleading statements to the Court. The Court concludes that none of these allegations, if proven, would render this case exceptional.

MWV argues that the case is exceptional due to Valois's serial litigation misconduct, including the premature filing of a summary judgment motion, relying on the French Blocking Statute to refuse to produce requested discovery, refusing to stipulate that quenching is the only remaining issue in the infringement determination, and denying MWV's request for admission regarding the crystallinity issue. However, as discussed above, the Court declines to comment on parties' litigation strategies.

MWV also argues that the discovery from Zeus was delayed due to Valois's interference. However, as the record and live testimony from Zeus's Jeffery Hawley indicate, Zeus is adamant about maintaining its production process as a trade secret. For instance, Mr. Hawley testified that Zeus never disclosed its manufacturing capabilities or abilities to customers, and it did not

let any customer observe its production process. He stated that this is its corporate policy, which directly ordered from the owner of the company. He explained that the policy is justified by commercial reasons because once customers learn about Zeus's manufacturing processes, they will be able estimate Zeus's cost in making certain products. Trial Tr. a.m., 51, 67, Sept. 20, 2011. Additionally, it appears to the Court that Zeus's resistance to reveal its trade secret was the major cause of delay of discovery. Despite Valois's repeated requests for more information about the production line, Zeus provided very little data. Zeus only submitted the necessary documents after a court order to compel discovery. MWV cannot impute Zeus's resistance to discovery to Valois because Zeus is not a subsidiary of Valois and Valois has limited control over Zeus's conduct.

MWV further argues that Valois made statements, which gave the impression that the Old tube was no longer produced or sold after the patents were issued. Yet Valois ordered the Old tube from Zeus and sold pumps containing the Old tube after the patents were issued. These may be instances of less-than-desirable litigation behavior; however, the order of the Old tube and the majority of these sales are commercial activities of Valois France who was found not liable for infringement. Additionally, Valois America sold pumps containing the Old tube on two occasions after the patents were issued. However, the two documented sales of pumps containing the Old tube by Valois America are relatively minor compared to its sales figure for pumps containing the New tube. As such, the impact of this alleged litigation misconduct is not significant enough to render the case exceptional. In sum, MWV has not shown the case against Valois is exceptional by clear and convincing evidence. Therefore, an award of attorney fees is not appropriate.

F. Injunction

Based on the four factors set out in *eBay*, the Court concludes that a permanent injunction against Rexam America and Valois America is warranted.¹⁵ Courts “may grant injunctions in accordance with the principles of equity to prevent the violation of any right secured by patent, on such terms as the court deems reasonable.” 35 U.S.C. § 283. A plaintiff seeking a permanent injunction must demonstrate: “(1) that it has suffered an irreparable injury; (2) that remedies available at law, such as monetary damages, are inadequate to compensate for that injury; (3) that, considering the balance of hardships between the plaintiff and defendant, a remedy in equity is warranted; and (4) that the public interest would not be disserved by a permanent injunction.” *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388, 391 (2006). “The decision to grant or deny permanent injunctive relief is an act of equitable discretion by the district court” *Id.*

1. Irreparable Harm

MWV has demonstrated that it has suffered an irreparable injury as the result of Defendants’ infringing activities because, instead of licensing to its competitors, MWV practices its patents and competes directly with Defendants in the United States and Defendants are the only other market participants making fragrance pumps with an invisible dip tube. The purpose of a permanent injunction is to prevent future infringement rather than compensate a patentee for past infringement or punish an infringer for past infringement. *Johns Hopkins Univ. v. CellPro, Inc.*, 152 F.3d 1342, 1367 (Fed. Cir. 1998). However, it is proper for a district court to consider past harm to a patentee when determining if the patentee is entitled to an injunction, especially

¹⁵ In this section, Rexam America and Valois America are collectively referred to as Defendants. Unless otherwise provided, the Court treats both Defendants as one entity in the injunction analysis because they are substantially similar. Both Rexam America and Valois America sell fragrance pumps, which contain an invisible dip tube in the United States. With respect to the market segment for fragrance pumps containing an invisible dip tube in this country, as MWV’s only direct competitors, Rexam America and Valois America’s business models and activities are substantially similar.

when “[p]ast harm to a patentee’s market share, revenues, and brand recognition is relevant to determining whether the patentee ‘has suffered an irreparable injury.’” *i4i Ltd. P’ship*, 598 F.3d at 861. In addition, the factors courts can examine in its irreparable harm analysis include: (1) whether the patentee practices its patent; (2) whether the patentee and the infringers are direct competitors in the marketplace; and (3) whether the infringement caused the patentee to lose market share. *See, e.g., K-TEC v. Vita-Mix*, 765 F. Supp. 2d 1304, 1318 (D. Utah 2011) (concluding patentee has established irreparable harm because it practices its patents and directly competes with infringer in the marketplace); *Advanced Cardiovascular Sys. v. Medtronic Vascular, Inc.*, 579 F. Supp. 2d 554, 558 (D. Del. 2008) (“Courts awarding permanent injunctions typically do so under circumstances where the plaintiff practices its invention and is a direct market competitor.”). The existence of a two-player market may be a substantial ground for granting an injunction because it creates an inference that an infringing sale amounts to a lost sale for the patentee. *Robert Bosch LLC v. Pylon Mfg. Corp.*, 659 F.3d 1142, 1151 (Fed. Cir. 2011). Moreover, a patentee is not required to prove that its specific customers stopped using its products because they switched to the infringing products. *i4i Ltd. P’ship*, 598 F.3d at 862.

In this case, MWV has decided not to license its NoC[®] technology to Defendants. *See, e.g., MWV Exs. 852, 1144*. Rather, it practices its patents and competes directly with Defendants, the only other competitors in the fragrance packaging market, in this country as well as in the world, for supplying fragrance pumps containing an invisible dip tube. It follows that after the patents were issued, fragrance pumps containing an invisible dip tube in the U.S. market are either patented products from MWV or infringing products from Defendants. This situation is akin to a two-player market, which provides a substantial basis for granting an injunction, as it

creates the inference that an infringing sale amounts to a lost sale for the patentee. *Robert Bosch LLC*, 659 F.3d at 1151.

Moreover, the record shows that Rexam America and Valois America have sold large quantities of infringing pumps, in the millions, since the patents were issued in 2010. There is no assessment as to the precise volume of sales that MWV could make without Defendants' infringing products in the market. However, given the nature of the market and the available sales data, it is reasonable to infer that if MWV was the only supplier after the patents were issued, it would have captured some of the sales made by Defendants in this country. Thus, the Court is persuaded that Defendants' infringement caused MWV to lose market share. As such, MWV has demonstrated that it has suffered an irreparable injury attributable to Defendants' infringing products. Furthermore, absent an injunction directed at Rexam's and Valois's accused devices, Defendants are free to continue selling the infringing products, and MWV will continue to suffer injury including lost market share.

2. Inadequate Remedies at Law

MWV has also demonstrated the inadequacy of legal remedies available to it because (1) the nature of the competition among parties makes it difficult to determine lost profits; and (2) reasonable royalties cannot fully compensate for MWV's injury. "Difficulty in estimating monetary damages is evidence that remedies at law are inadequate." *i4i Ltd.*, 598 F.3d at 862 (citing *Broadcom Corp. v. Qualcomm Inc.*, 543 F.3d 683, 703-04 (Fed. Cir. 2008)). Two alternative categories of infringement compensation are the patentee's lost profits and reasonable royalties. *Lucent Techs., Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1324 (Fed. Cir. 2009) (citing *Panduit Corp. v. Stahl Bros. Fibre Works, Inc.*, 575 F.2d 1152, 1157 (6th Cir. 1978)). If the patentee practices the patent, "the patentee may seek to recover damages based on a theory of

lost profits,” which requires “determin[ing] the sales and profits lost to the patentee because of the infringement.” *Rite-Hite Corp. v. Kelley Co.*, 56 F.3d 1538, 1569 (Fed. Cir. 1995) (internal citation omitted). “[W]hen the parties involved in an action are the only suppliers in the market, lost profits are a particularly appropriate measure of damages.” *Kori Corp. v. Wilco Marsh Buggies and Draglines, Inc.*, 761 F.2d 649, 653 (Fed. Cir. 1985). The reasonable royalty is what the patentee would have received through arms-length bargaining. *Lucent Techs.*, 580 F.3d at 1324.

MWV retained Terry Lee Musika, an accountant and a financial investigator with decades of experience, as an expert witness who testified about the harm MWV has suffered as a result of the alleged infringement by Defendants. Although Mr. Musika has access to the parties’ sales data, he was unable to calculate the lost profits damages with a reasonable degree of certainty. For example, Mr. Musika found evidence of price erosion of the dip tubes, *i.e.*, the price of the invisible dip tubes started at a premium, but overtime that price eroded for all three parties. Nonetheless, MWV may not recover for price erosion as part of its lost profits. A patentee may recover for price erosion if patentee can show that, but for the infringement, it would have been able to charge and receive a higher price. *See Lam, Inc. v. Johns-Manville Corp.*, 718 F.2d 1056, 1065 (Fed. Cir. 1983). It is not required that the patentee knew that the competing system infringed the patent, if the patentee reduced its price to meet the infringer’s competition. *Brooktree Corp. v. Advanced Micro Devices, Inc.*, 977 F.2d 1555, 1580 (Fed. Cir. 1992) (price erosion losses, when reasonably related to the infringing activity, may accrue before the infringement has been verified or proved in court). However, the patentee must establish the amount of the price reduction, and that the price was reduced in response to the competing bid. *Vulcan Eng’g Co., Inc. v. Fata Aluminum, Inc.*, 278 F.3d 1366, 1377 (Fed. Cir. 2002).

Here, Mr. Musika stated one of the reasons for price erosion is that the parties engaged in fierce competition and each had the ability and willingness to use price as a competitive tool during the several years before the patents were issued. *See, e.g.*, MWV Ex. 1113. As such, Mr. Musika cannot identify price erosion that was exclusively due to the sales of an infringing party. Consequently, MWV cannot recover for price erosion. Therefore, if Defendants are allowed to continue selling the infringing products, MWV will continue to suffer the injury. Yet it cannot be adequately compensated for the injury it sustains.

Moreover, a reasonable royalty is not an adequate remedy to compensate for MWV's injury. A reasonable royalty is the floor below which damages shall not fall. *Bandag, Inc. v. Gerrard Tire Co.*, 704 F.2d 1578, 1583 (Fed. Cir. 1983). Moreover, whether the patentee chose to license the patent is a factor the court could consider in determining whether a reasonable royalty can compensate for an infringement. *Acumed LLC v. Stryker Corp.*, 551 F.3d 1323, 1328 (Fed. Cir. 2008) (stating that the fact that a patentee has previously chosen to license the patent may indicate that a reasonable royalty does compensate for an infringement).

Mr. Musika acknowledged that he calculated a reasonable royalty for the past infringement. However, he testified that a reasonable royalty does not include items of lost profits such as the price erosion discussed above. He regarded reasonable royalty as a secondary measure, which does not reflect the full magnitude of MWV's injury.

Additionally, although the record indicates that MWV was contemplating licensing its patents to its strategic customers, MWV has decided not to license its patents concerning the NoC[®] technology to direct competitors. *See* MWV Exs. 852, 868, 1139, 1144. No operative or enforceable license agreement was presented during the trial. *See, e.g.*, MWV 1139. As such,

given the nature of the business and structure of the relevant market segments, the fact that MWV does not license the patents-in-suit indicates that a reasonable royalty is not adequate compensation for infringement.

Valois argues that money damages are adequate in this case because the invisible dip tube is only a “small component” of the fragrance product. Valois cites Justice Kennedy’s concurring opinion in *eBay*, where he explains that monetary damages may be sufficient when the patented technology is a small component of a larger product. *See eBay*, 547 U.S. at 396-97. This argument is misplaced. This case is about pumps with an invisible dip tube, and the tube is the decisive factor for the commercial success of the pumps. The record shows that the invisible dip tube is the central feature for the pumps because of its ability to enhance the aesthetic appeal of the fragrance products. The importance of the invisible dip tube is also illustrated by fragrance houses’ responses to the invisible tube and the sales record of the pumps containing an invisible dip tube.

3. Balance of Hardships

The balance of hardships prong favors MWV. In considering the balance of hardships between the plaintiff and defendant, courts may evaluate the parties’ sizes, products, and revenue sources. *i4i Ltd.*, 598 F.3d at 862. “[N]either commercial success, nor sunk development costs, shield an infringer from injunctive relief,” as an infringer is not entitled to continue infringing simply because it successfully exploited its infringement. *Id.* at 863. Here, each party is a part of a large international company with worldwide operations and distribution systems. Revenue generated by the infringing products is only a fraction of each defendant’s overall business portfolio. However, based on the past effects of Defendants’ infringement, the injury MWV will sustain without injunction is apparent. MWV owns the patents responsible for making the rapid

development of a new segment of the fragrance pump market. Yet, the benefits MWV received for its patents are overshadowed by Defendants success in selling their infringing products. Absent injunctive relief, MWV will continue to suffer injuries to its business and future sales opportunities.

Furthermore, potential hardship caused by an injunction against Defendants is minimal. The invisible dip tube targets only the high-end of the general fragrance market. There are also practical reasons for a fragrance company not to use the invisible tube, such as the expense, particularly when fragrance containers are not transparent. The invisible dip tube is considered a niche product. *See, e.g.*, Trial Tr. p.m., 28-29, Sept. 26, 2011. Additionally, the record shows that the sale of pumps containing an invisible dip tube is only a small percent of the overall sales for each defendant. *Rexam Ex. 350*. Defendants can still compete and be successful in the business for pumps with a regular dip tube. *See, e.g.*, *Valois Ex. 285* at 17. Thus, Defendants' competitiveness in the market of fragrance packaging will not be seriously affected by the injunction. Accordingly, the balance of hardships favors MWV in this case.

4. Public Interest

The Court finds that this factor is neutral. MWV generally argues that public interest is best served by protecting patent rights, but it fails to offer specific reasons in support of its argument. Since there has been no persuasive showing that the public interest would be served or disserved by an injunction, this factor does not favor either party. After considering all of the *eBay* factors, the Court concludes that a permanent injunction against *Rexam America* and *Valois America* is warranted in this case.

V. CONCLUSION

For the foregoing reasons, the Court concludes that (1) Defendant Rexam Beauty and Closures Inc. ("Rexam America") is liable with respect to Count I; (2) Defendant Rexam Dispensing Systems SAS ("Rexam France") is not liable with respect to Count I; (3) Defendants Rexam America and Rexam France are not liable with respect to Count II; (4) Defendant Valois of America, Inc. ("Valois America") is liable with respect to Count III; (5) Defendant Valois SAS ("Valois France") is not liable with respect to Count III; (6) Defendants Valois America and Valois France are not liable with respect to Count IV; (7) Plaintiffs MeadWestvaco Corporation and MeadWestvaco Calmar are not entitled to an award of attorney fees; and (8) Plaintiffs MeadWestvaco Corporation and MeadWestvaco Calmar are entitled to injunctive relief against Defendants Rexam America and Valois America.

Accordingly, it is hereby

ORDERED that judgment is entered in favor of Plaintiffs MeadWestvaco Corporation and MeadWestvaco Calmar and against Defendant Rexam America on Count I. It is further

ORDERED that judgment is entered in favor of Defendant Rexam France and against Plaintiffs MeadWestvaco Corporation and MeadWestvaco Calmar on Count I. It is further

ORDERED that judgment is entered in favor of Defendants Rexam America and Rexam France and against Plaintiffs MeadWestvaco Corporation and MeadWestvaco Calmar on Count II. It is further

ORDERED that judgment is entered in favor of Plaintiffs MeadWestvaco Corporation and MeadWestvaco Calmar and against Defendant Valois America on Count III. It is further

ORDERED that judgment is entered in favor of Defendant Valois France and against Plaintiffs MeadWestvaco Corporation and MeadWestvaco Calmar on Count III. It is further

ORDERED that judgment is entered in favor of Defendants Valois America and Valois France and against Plaintiffs MeadWestvaco Corporation and MeadWestvaco Calmar on Count IV. It is further

ORDERED that Plaintiffs MeadWestvaco Corporation and MeadWestvaco Calmar are entitled to no economic damages for Defendant Rexam America's violations under Count I. It is further

ORDERED that Plaintiffs MeadWestvaco Corporation and MeadWestvaco Calmar are entitled to no economic damages for Defendant Valois America's violations under Count III. It is further

ORDERED that Plaintiffs MeadWestvaco Corporation and MeadWestvaco Calmar are not entitled to an award of attorney fees. It is further

ORDERED that Plaintiffs MeadWestvaco Corporation and MeadWestvaco Calmar are entitled to injunctive relief against Defendants Rexam America and Valois America. Plaintiffs are directed to submit within 14 days a proposed injunction order and notice the matter for a hearing. Defendants' responses to Plaintiffs' proposed injunction order are due within 7 days of receipt of the proposed order.

The Rule 58 judgment Order will not be issued until the Court enters the injunction Order. The time for appeal will not run until the Court enters the Rule 58 judgment Order.

The Clerk is directed to forward a copy of this Order to counsel of record.

ENTERED this 12th day of April, 2012.

Alexandria, Virginia
4/12/2012

/s/
Gerald Bruce Lee
United States District Judge